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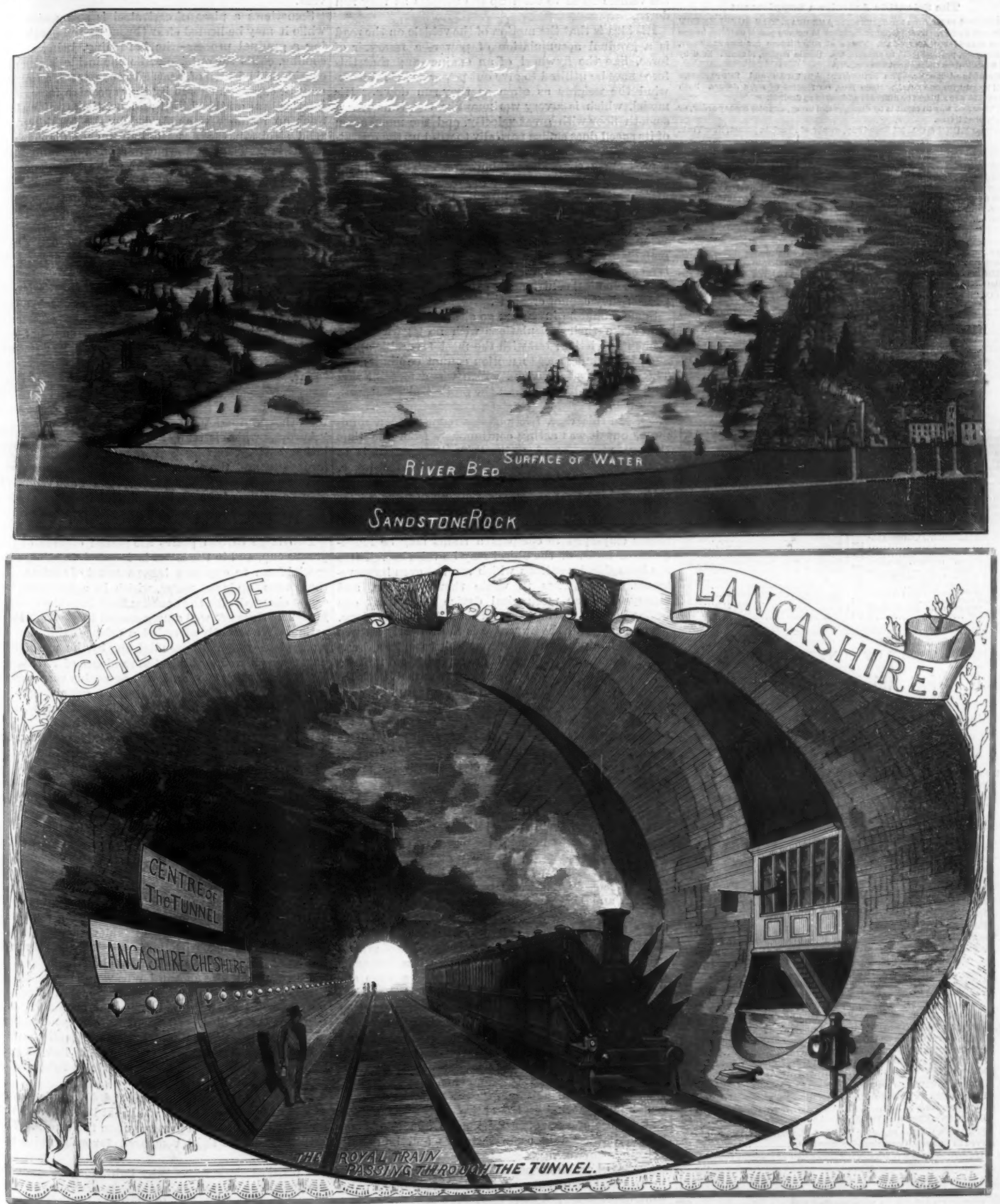
THE MERSEY TUNNEL.

We present herewith several illustrations of the new tunnel under the river Mersey, between the two cities of Liverpool and Birkenhead, which occupy a somewhat similar position in respect to each other as New York and Brooklyn. The London *Graphic*, from which our views are taken, says: An improved connection between the two banks of the Mersey estuary has been a problem for a very long time. There was a ferry across the river as early as the eleventh century. In 1832 the first steam ferry boat, of which we give an illustration, was launched, and since that time the traffic has so greatly increased that the present ferry carried last year 26,000,000 of passengers and 750,000 tons of goods. Schemes for bridges, pneumatic railways, etc., have also been mooted at various times, and as long ago as 1864 a bill

(*Continued on page* 164.)



THE NEW TUNNEL UNDER THE MERSEY RIVER, BETWEEN LIVERPOOL AND BIRKENHEAD.

Scientific American.

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NEW YORK, SATURDAY, MARCH 13, 1886.

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UNSUCCESSFUL INVENTORS.

Inventive talent may exist and yet be utterly useless to its possessor. There are persons whose keen observation detects readily the need of improvement in some crude device, or whose capacity suggests some new thing or better method, but who are unable to devise the one or to give form to the other. Lack of persistence, cowardice in the face of discouragement, want of mechanical experience, ignorance of natural laws, one or all combine to bar the road to success. If the time and talent misspent on attempts to achieve perpetual motion had been directed to some possible improvement, the advance in mechanical art would be greater than it is. There are mechanics who ridicule the idea of discovering the means of perpetual motion, who are not ashamed to employ their time and skill on an absurdity fully as ridiculous. There is a bright mechanic, somewhat of an inventor in a small way, living in an Eastern city, who has been for several months trying to produce a road vehicle that shall run by weight, or by two weights, depending on the motion of the vehicle itself to wind up the weights as they run down.

His idea is that the motion of the vehicle on the road is a gradual accumulation of power—a reservoir of force, like the flywheel of an engine—and that this force may be utilized to give out power sufficient to rewind the weights as often as they run down. His model, which is a very workmanlike toy, runs over a smooth floor with great velocity, and the momentum of its speed does suffice partially to wind up the operating weight, and thus gives it another (somewhat feeble) start from a condition of almost rest. The mechanic hopes to give greater force to the winding-up arrangement, and make his self-propelled vehicle successful over city streets and good roads.

His belief in the power of mechanical devices to develop more power than is imparted is not an uncommon one; the expectation of getting more than is given is a common hallucination—it is the universal desire. But mechanical contrivances can only divert and direct power; they cannot create it.

Some would-be inventors go ahead with their work, and make their calculations with no regard to the element of friction; but with the most favorable appliances this hinderance to motion cannot be eliminated. The writer has seen a top, which was a metallic ring with a thin web connecting the pintle and point, run, after being speeded, thirteen minutes on a plate of glass. In this case, friction was reduced to a minimum, but it was acting continuously from the time the top was started until it finally brought it to rest. The elements of weight, atmospheric resistance, rubbing of surfaces, and imperfection of workmanship combine to produce friction, an obstacle that no mechanical device can overcome.

The inventor sometimes misdirects his efforts; the means employed to compass a result may be inadequate or unfit, or the object may be valueless. There are *bona fide* inventions which are not even improvements. It is useless to waste thought, time, and money on some mechanical device to do what can better be done by hand, yet this is frequently done.

The success of the inventor is more nearly assured when he is a practical workman, able to make a drawing, to construct a model, or, at least, to make a sketch and whittle out his idea; for verbal explanations to the professional model maker are not always clear. It is true, however, that some very valuable inventions have been conceived by men who were not practical mechanics, but how much of the success was due to the intelligent skill of the model maker and the manufacturer of the invention is not stated in the letters patent.

HARDENING CAST STEEL.

It is no uncommon event to have a nicely finished tool or other article spoiled in the hardening. This is the more vexatious because the cause of the disaster frequently cannot be discovered. Defective steel can usually be detected by a flaw. Overheating can be guarded against, and there may be invitations to a fracture which are avoidable. Pieces are sometimes lost in hardening because they are not properly prepared for the exacting test of fire and cold water. A piece of greatly varying dimensions will sometimes fly when it touches the bath, even if the heating has been even and "suant." Especially is this the danger if there is a cornered offset between the thick and the thin portion. In such cases, it is better to leave the piece unfinished and more uniform, and afterward finish it by grinding. The writer has been quite successful in such cases by dipping the thinner portion first—when the form of the piece would admit of it—and then the thicker portion, which would half temper the thin portion by its remaining heat before the entire piece was chilled. But articles of very disproportionate dimensions may be casehardened in some instances and be equally durable.

Cast steel articles containing cavities should always be provided with vents. A die block containing a die-sunk depression, not more than five-eighths of an inch deep, was ruined by being cracked in hardening, because the workman carelessly dipped it face downward.

A workman made a hollow mill for turning fixed studs on a casting. The hole in the mill was three-quarters of an inch diameter and two and a quarter inches deep. The mill was made from a round bar, two and a quarter inches diameter, as the radial teeth on the end were to face up a bearing more than two inches diameter at the bottom of the stud as well as to turn the stud. All around the hole there was three-quarters of an inch of solid metal. The piece was heated over an open charcoal fire, and dipped perpendicularly in the bath to a depth of about three-quarters of an inch, the remaining heated portion being relied upon to draw the hardened end. But the tool cracked more than half way around. A second mill shared a similar but worse fate, for on withdrawing it from the bath a broken portion was left behind, the mill having cracked entirely around. A pinhole was drilled in a third tool near the bottom of the hole and the hardening was successful, the minute hole being a vent.

Sometimes a piece of cast steel is so massive that while it may be heated clear through—the heating being a gradual process—the hardening, being sudden cooling, chills the outside while the inside is still at a considerable degree of heat. In such cases, a fracture may be expected, caused by the expansive force of the interior heat on the chilled and brittle exterior shell. Such an instance was afforded by the breaking of a solid steel tap, three and a half inches diameter, in hardening. The tap was cut to a pitch of eight to the inch, and finished. A piece from the lower end, two inches long, broke square off in the bath. The appearance of the fracture indicated that absolute hardening had extended slightly beyond the bottom of the teeth, the interior portion being apparently unchilled. The remedy in this and in similar cases is to drill a hole from end to end through the center of the piece.

Electric House Lighting by Primary Batteries.

Numerous attempts have been made to obtain a successful incandescent electric light by means of secondary storage batteries, charged from dynamos, but, owing to the small amount of electricity obtained in comparison with the power required, these batteries have so far, we believe, not been proved to be a commercial success.

One of the latest improvements in this direction has been the production of a primary battery, named the "Aurora," which is really an improved bichromate solution battery, having a power which is remarkable for its size, and the advantage of not polarizing, heating, or evolving any deleterious gases. Each cell holds about a gallon of the exciting fluid, which, we are informed, is made by a peculiar patented process, and is the important factor in the success of the battery.

Two large carbon plates are placed outside of the porous cup, and in the latter is inserted the zinc, of a special form to expose a large amount of surface. In the porous cup is put water, which in a few hours becomes charged with the exciting fluid from the outside jar. The zincs are well amalgamated to prevent local action. We recently attended a private exhibition of a complete system of house lighting by the use of this battery, as introduced into the residence of Mr. Henry V. Parsell, of this city, and were agreeably surprised to notice the power of the battery in sustaining with beautiful brilliancy several incandescent lamps, and the facility with which they could be lighted.

In a room adjoining Mr. Parsell's laboratory, together with a fine large screw-cutting geared lathe and other highly polished steel tools, were located on shelves twenty-eight cells of battery. None of the tools were corroded or in the least damaged by reason of fumes emanating from the battery.

In addition to its use as a lighting battery, it was shown that it could be employed as a motive power for driving the large lathe, by means of a small Cleveland electric motor, developing a force equivalent to one-third of a horse power.

A special switch was provided, which enabled the operator to utilize at once the force from one to twenty cells, as might be needed. No difficulty was experienced in rapidly boring, with large sized drills, through blocks of the hardest wood, two inches thick.

Many novel uses of the lamps were shown; half a dozen six-candle lights placed in a cabinet of minerals, when turned on, instantly lighted it perfectly. In a dome in the ceiling of the laboratory, painted blue and decorated with gilt stars, were hidden from view a group of small lamps. These when lighted produced a very soft, radiant effect, giving a light similar to that of a full moon on a clear night.

A special small Edison lamp of 40 candle power placed in a magic lantern was next lighted, and the pictures in the lantern thrown upon the screen. The brilliancy of the light compared favorably with the lime light.

A peculiar dark room ruby light, for photographic purposes, was shown, and also the perfect adaptability of small lamps for illuminating safely dark closets. Adjustable lights with neat porcelain shades mounted

on a stand for desk use or for reading purposes, as well as suspended lamps, were also exhibited.

We were informed that about thirty lamps of varying candle power had been distributed about the house, but the full power of the battery was not capable of sustaining more than eight sixteen candle power lights at a time.

It was expected that for ordinary use but half a dozen lamps would be used at once.

In comparison with the results obtained, the loss of zinc in the battery is exceedingly small. Mr. Parsell stated that although the zincs had been constantly immersed and the battery had been working for two months, the zincs had lost but a few ounces each in weight. He had replenished the battery but once during that time, having used it every day.

The advantage of having electricity generated for general use in one's house so easily, and with so little trouble and danger, as this battery appears to furnish it, cannot be overestimated.

We understand its practicability has been so well established by prolonged experiment that a new company, with a large capital, called "The Household Electric Light Manufacturing Company," of New York, has been organized for the purpose of putting in electric plants in private residences and caring for the batteries, keeping the same in order.

The small lamps, their attachments, and the battery are supplied by the Stout-Meadowcroft Company, of this city.

Impurities in Metals.

Mr. W. Chandler Roberts-Austen, F.R.S., Chemist of the Mint, delivered lately at the Royal Institution, London, the first of four lectures upon "Metals as Affected by Small Quantities of Impurity." He said that metallurgy has to deal at once with large masses and with small particles, for the influence of the latter upon the former is out of all proportion to their relative quantities, and their action may be chemical, or physical, or both. Minute impurities in metallic copper would render, he said, ocean telegraphy impossible. Geber proved that the "cry" of tin, or the noise which it makes when bent, can be removed by purification. Arsenic in the most minute proportion will restore the cry of tin, and its action in this respect has been known at least since the third century of our era; arsenic makes tin as brittle as zinc. The fact that such small proportions of foreign matter so alter the character of metals tended more than anything else to confirm the alchemists in the doctrine of transmutation, and encouraged them in their attempts to make gold by artificial means. A little arsenic in melted lead will make it more fluid, so that when poured down an inclined plane, say, of white paper, the lead will roll itself into small shot; with the arsenic absent, it will merely chill in a black streak upon the paper. The speaker proved this by experiment, and invited attention to the following figures:

ANALYSIS OF LEAD SHOT.

Lead, with small quantities of antimony, iron, etc.	99·72
Copper	0·16
Arsenic	0·12
	100·00

This proves what a very small proportion of arsenic is necessary to produce the effect.

Zinc, said the lecturer, melts at 412° C., and standard gold at about 900° C., but if less than 0·2 per cent of silica be added to gold, it will soften in the flame of a candle. This was demonstrated by experiment. A trace of antimony in melted lead will cause it to oxidize on the surface much more rapidly than would otherwise be the case, and by stirring the mass it is soon transformed into a kind of pasty oxide. Cadmium also promotes the oxidation of pure melted lead, and that, too, with a play of the most beautiful colors. Mr. Roberts-Austen proved this by illuminating the surface of the melted alloy with a beam of parallel rays from the electric lantern, and projecting upon the screen an image of the surface of the molten mass; as the films of oxide formed they were removed with a little scraper, to make way for fresh surfaces, having somewhat the colors of shot silks. He stated that it may not be generally known that copper can be gilt as well by the application of an alloy of lead and gold to its surface as it can by an amalgam of mercury and gold. On the application of heat the copper absorbs the lead, and the gold is left on the surface. This process is recorded in a papyrus of the third century, now preserved at Leyden.

The alchemists, he said, through several successive generations down to the year 1746, authoritatively taught it to be a fact that all metals were composed of mercury and sulphur, combined in different ways; and those of them who claimed to have made gold almost invariably said that they had done so "by the aid of a powder received from a stranger." Dr. James Price, of Guildford, a Fellow of the Royal Society, was the last of the alchemists who believed in the transmutation of the baser metals into gold; he lived in the eighteenth century. Raymond Lully was confined in the Tower by one of the English kings, in order that he might make gold for the mint.

Even the illustrous Robert Boyle believed in the transmutation of metals, because in the usual orthodox way he had "received from a stranger" a powder which would change 1,000 times its weight of gold into a baser substance, and he did not see why the operation might not be reversed. He had probably made what is most dreaded at the mint, an alloy of gold and lead. The lecturer here melted down one hundred sovereigns, and cast a little of the molten metal into a small bar, to show that the metal was strong and malleable and tough. To the remaining greater bulk of the molten gold he, however, added a trace of lead, and cast the mixture into a large thick bar, which, when almost cold, and when held in the palm of the hand, broke into pieces upon being tapped with a hammer. A small trace of lead, he said, will reduce the breaking strain of gold from 20 tons to the square inch to 5 tons, as indicated by a testing machine.

He then stated that palladium will absorb 900 times its volume of hydrogen gas, and give it out again when heated. A remarkable discovery has recently been made in France, that an alloy of rhodium and lead will absorb nitrogen and oxygen, and when heated give them off, as gun-cotton does, with explosive violence. He placed a small piece of rhodium, containing 17 per cent of lead, in a tube, and next withdrew the air from the tube by means of the Sprengel pump. The heat of a spirit flame was then applied to the end of the tube containing the piece of rhodium and lead, and the alloy broke up with a small explosion, filling the end of the tube with metallic dust. The gases liberated were chiefly the same as those given off by ignited gun-cotton.

Pneumonia.

The prevalence of pneumonia, its rapid increase, and fatal consequences in many instances, have led a number of our abler physicians to carefully investigate the peculiarities of this alarming disease, and some of them have published the result of their observations in a way to benefit the public, not only by pointing out the best methods of prevention, but likewise of treatment, in the event of its occurrence.

Dr. John T. Nagle, Deputy Register of Records of the Health Board of the city of New York, has given much attention to the disease, and has prepared valuable statistical tables concerning it.

"The prevalence of pneumonia," he says, "may be owing to a lack of ozone in the air, or it may be because there is too much ozone. Sudden changes of weather and high winds, particularly from the north and east, certainly have much to do with it, and draughts of all kinds are bad, and should be avoided. Smoking may be a predisposing cause, as tobacco is certainly an irritant. Anything which irritates the lungs should be avoided. If people would breathe through the nose instead of through the mouth, especially when in the open air or facing a cold wind, the lungs would be less irritated.

"One great cause of the fearful death rate among children from this disease is undoubtedly the criminally foolish way in which they are dressed. Many mothers seem more anxious to make their children look pretty than to dress them comfortably. On a par with this is the folly of low-necked dresses among women as viewed from a health standpoint. Ladies so dressed will rush from a heated ballroom or theater into the open air, and then wonder that they have colds or pneumonia. Wear seasonable underclothing, and don't remove your heavy flannels too early in the spring or defer putting them on until too late in the fall. I should not advise people to coddle themselves, but one should dress according to the season, and should cover the body evenly. Add to this a proper regard for the general health and an avoidance of draughts, and one need not worry much about pneumonia."

Prof. A. L. Loomis, in his "Practice of Medicine," says: "It is a well-known fact that the disease attacks the poor oftener than the rich, the private oftener than the officer, the sailor on shore oftener than on ship, the soldier oftener than the civilian at the same post. It is unknown in the polar regions and common on the Mediterranean, increasing in a direct ratio from the poles to the equator. Elevation above the sea predisposes to it; north and east winds favor its development; rainy seasons or damp and marshy districts do not seem to influence it. Periods of steady and extreme cold have little effect except upon the old, but sudden changes are very disastrous. The first predisposing cause is age, the disease being most common in early childhood, from twenty to forty, and after sixty. The proportion of male to female victims is as three to one. Any general condition of the body which debilitates is a predisposing cause. The complications which render the disease so dangerous are those which diminish the nerve supply or weaken the muscular power of the heart. Bad sewerage and miasmatic influence are potent causes of the disease."

Pneumonia usually begins with a chill, intense and prolonged, generally at night, and followed by a correspondingly high fever and sharp pains in the sides. The disease is very rapid in its progress, reaching a crisis in from five to six days, and sometimes causing death within three days. Usually but one lung is affected, and often the disease is confined to a single lobe.

A person may have "double pneumonia," or pneumonia of both lungs, and recover from it, but the chances are against him. When the disease spreads to all of the lung lobes, death is certain, as the patient cannot breathe, and dies of suffocation. The diseased lung, at first inflamed, soon becomes hard and leathery, and incapable of performing its natural functions. A curious fact is that usually no second chill occurs when another lobe is attacked, and there appears to be no relation between the amount of lung affected and the intensity of the symptoms. All physicians agree in saying that the disease is not contagious, but may be epidemic, and it has been noticed that it is developed under the same conditions as diphtheria—that is, the conditions which produce diphtheria in the young are apt to cause pneumonia among adults.

Dr. J. R. Leaming, special consulting physician in chest diseases in St. Luke's Hospital, has published a little pamphlet concerning it, entitled "Endemic Pleuro-Pneumonia, as seen in New York during the past ten or twelve years." In that pamphlet Dr. Leaming holds to the theory that the pneumonia of the present day, or pleuro-pneumonia, as he calls it, is the same as the epidemic which caused such havoc among the troops in Canada during the war of 1812–15.

That the weather has much to do with pneumonia is apparent. The number of deaths in New York city for the first seven months of last year was as follows: January, 375; February, 486; March, 587; April, 512; May, 337; June, 229; July, 150. After August there is usually a steady increase until March, the most fatal month of the year. The death rate, too, is very high. The statistics so far published, both in hospitals and private practice, show an average death rate of at least 20 per cent, or one in five of those attacked.

The theories concerning the nature of the disease itself are many and varied. Some physicians hold that pneumonia is only a local manifestation of a general disease, others that it is a specific disease caused by a specific poison, while still others hold as tenaciously to the germ theory.

Without speculating upon these different theories, from what has been said in which all agree, it is plain that anything which lowers the vitality of the system is conducive to the disease, and should be carefully avoided. Overwork, either physical or mental, has much to do with it, and this explains why so many business men and brain workers become its victims. Sudden changes of the weather and draughts of all kinds are also to be guarded against. In a word, live temperately, dress warmly, avoiding all manner of imprudences, and you need have no fear of pneumonia.—*Hall's Journal of Health.*

DECISIONS RELATING TO PATENTS.

Complainants received letters patent Nos. 64,404 and 80,269 for improvements in tuck markers, which proved to be of little value. Defendant made improvements on same which cured the defects and rendered the device marketable. Complainants obtained a decree for assessment of damages and profits for infringement of the above patents. *Held* by Judge Butler, United States Circuit Court, Eastern District of Pennsylvania, Bostock and Wife *v.* Goodrich, that complainants must show what proportion of profits arising from the sale of the improved tuck markers was due to the original invention, and that, failing in that, they were entitled to nominal damages only.

Where one party stands by and permits another to take out a patent, and then takes out a patent for a different invention, he cannot set up that he is the inventor of the first improvement.

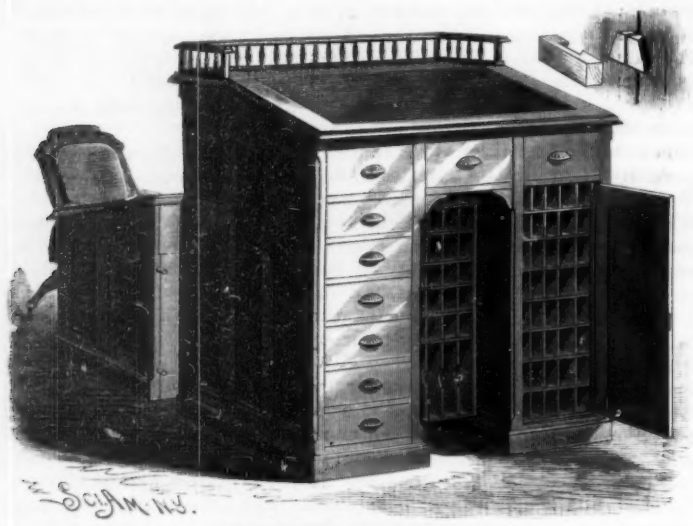
[The facts are as follows: Both parties claimed priority of invention. Complainant obtained a patent January 16, 1883. Defendant claimed that he made the invention at a time when he was employed by complainant in his shop, and it appears that he stood by while complainant made application for a patent without making any claim, and subsequently took out letters himself for another and a different invention. Butler, J., United States Circuit Court, Eastern District of Pennsylvania, Fraim *v.* Keen.]

The employment of mechanical skill to construct a machine in accordance with ideas furnished by another gives no right to the invention. The entire merit is in him whose inventive suggestiveness conceived the invention. McKennan, J., United States Circuit Court, Eastern District of Pennsylvania, Yoder *v.* Mills.

THE old and popular firm of J. Stevens & Co., of Chicopee Falls, Mass., manufacturers of the celebrated Stevens fire-arms and fine machinists' tools, have sold out their business to the new corporation just formed under the name of the J. Stevens Arms & Tool Co., with the following officers: Joshua Stevens, President; William B. Fay, Joshua Stevens, George S. Taylor, Directors; Irving H. Page, Secretary; Jas. E. Taylor, Agent and Treasurer. The above took possession of the business January 1, 1886.

IMPROVED DESK.

The invention herewith illustrated consists of a standing desk and a sitting desk held together by suitable devices in such a manner that they can be disconnected when desired and used singly. The standing desk has an inclined writing top of the usual kind, and in its front has drawers at one side and pigeon holes at the other. In the center opening is a sliding frame containing pigeon holes and book shelves. The sitting desk has drawers at one side and pigeon holes at the other, and its back is made plain. The upper part of the back of the standing



POHL'S IMPROVED DESK.

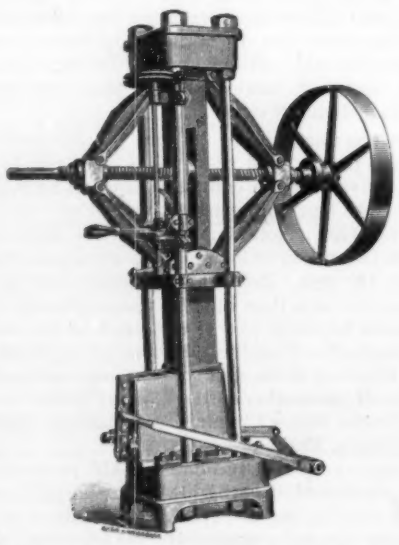
desk has drawers at each side, and between which is a recess formed with shelves. When the desks are united, the upper part of the standing one forms a top above the other. A half wedge is secured on the outer surface of each partition of each desk at the rear edge; the desks are held together by a dovetailed key (shown at the right in the engraving) passing over the wedges. Dowel pins projecting from the back of one desk enter holes in the back of the other. When united, the desks are placed in the middle of the room so that both can be used; when disconnected, each can be placed against the wall.

This desk is the invention of Mr. Henry U. Pohl, of Hiawatha, Kansas.

HOP PRESS.

It is well known that a combination of the screw and knuckle joint will produce an almost unlimited power. Presses using this combination have been made for many years by the well known Boomer & Boschert Press Company, of Syracuse, N. Y., who, having made a specialty of their manufacture, have adapted them to an infinite variety of purposes, among which is the subject of our illustration.

This press is used for the compression into small packages of hops, mint, catnip, sage, etc. The box has two compartments, so that while the material in one is



BOOMER & BOSCHERT PRESS CO.'S HOP PRESS.

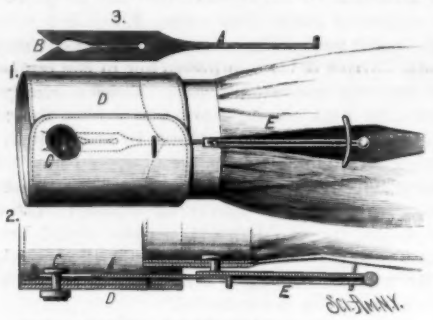
under pressure the other is being filled. It is of sufficient depth to hold five or more cakes in each compartment, the cakes being separated by plates, so that each cake is subjected to pressure five or more times. The box is moved so as to bring each end alternately under the plunger by the lever and connecting links shown. Each movement of the box leaves one of the pressed cakes in a depression in the base of the press. When run by their automatic power attachment, it is claimed from 600 to 900 cakes can be made per day of ten hours by one man.

Blasting Coal with Lime.

With respect to the compressed lime cartridges which are now used in a good many collieries, it may be said that the lime is in a caustic state, made from mountain limestone. This is ground to a fine powder, and consolidated by a pressure of 40 tons into the form of cartridges 2½ inches in diameter, having a groove along the side. These are then packed in air tight boxes to protect them from the damp, and are sent to the mine. Shot holes are drilled in the face of the coal, and an iron tube half an inch in diameter, having a small external channel or groove in the upper side, and provided also with perforations, is then inserted along the whole length of the bore hole. This tube is inclosed in a bag of calico, covering the perforations and one end, and has a top fitted on the other end. The cartridges are inserted and lightly rammed, after which a small force pump is connected with the tap, and a quantity of water equal in bulk to the quantity of lime used is forced in. The water, being driven to the far end of the shot tube through the tube, escapes along the groove and through the perforation, and the calico, flowing toward the tamping into the lime, saturating the whole and driving out the air before it. The tap is then closed to prevent the escape of the steam generated by the action of the water on the lime, and the flexible pipe attached to the pump is disconnected. The action of the steam first takes place, cracking the coal away from the roof, and this is followed by the expansive force of the lime. There is no fire or flame, and the coal is got with a very low percentage of small.—*I. and C. Trades Review.*

IMPROVED CUFF ADJUSTER.

This cuff holder is so made that the cuff can be readily moved in or out, and will be held securely in



STUYVESANT'S IMPROVED CUFF HOLDER.

either position. Upon the outer end of the thin sheet metal bar, A, is formed a spring catch to engage with the shank of the stud, C. The rear end of this bar is fitted to slide in the grooved piece, E, as shown. To the outer end of the grooved piece, on the side opposite the groove, is secured the shank of a button. To use the device the spring catch is made to engage with the shank of the stud, the button is passed through the holes in the wristband, and the grooved piece is passed up the shirt sleeve and confined by a loop. The cuff can be held in any desired position by adjusting the sliding bar, the friction in the grooves being sufficient to hold it firmly.

This invention has been patented by Mr. Robert Stuyvesant, of 2 Pine Street, New York city.

Minneapolis Industrial Exposition.

The industrial exposition which opens at Minneapolis on the 23d of August next is among the first of the large expositions held in the Northwest. Both the site and time have been well chosen. The remarkable industrial development of Minneapolis, particularly in the fabrication of food products, will attract a large attendance. Hon. W. D. Washburn is president of the exposition.

PARASOL HOLDER FOR CHILDREN'S CARRIAGES.

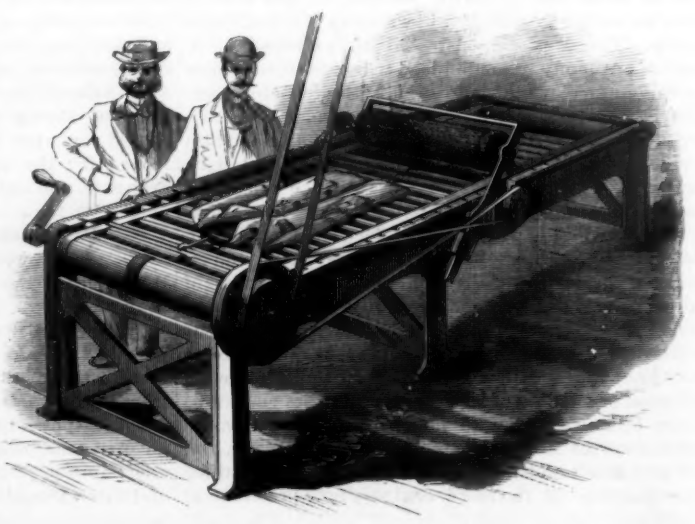
This simple device, to be attached to children's carriages, is designed for carrying a parasol for the protection of the person pushing the carriage. On the cross bar of the handle of the carriage is a sleeve, which can be held in any desired position by a wing nut. One side of the sleeve is made flat, and on this side is pivoted an arm, the free end of which is formed with a curved slot through which passes a wing bolt. The arm is also formed with a socket for receiving a rod, which can be clamped in any position. The staff of the parasol passes through a clamp held to the upper end of this rod; this clamp can be turned and held at any desired angle. It will be seen that by means of this device the parasol can be secured in any required position. The parasol and rod can be easily removed when it is necessary to use the carriage without the holder. This invention has been patented by Mr. Robert Ward, of Lawrence, Mass.

WARD'S PARASOL HOLDER FOR CHILDREN'S CARRIAGES.

BRUSHING MACHINE.

The engraving represents a machine for rapidly and thoroughly brushing garments of all kinds. Rollers are journaled in each end of the frame, one roller having a crank handle on one end and two belt pulleys on the opposite end. Over these rollers pass two endless belts which are united by cross rods, each having a bend at the middle. The upper parts of the belts run on a series of rollers journaled in the side pieces of the frame, and each provided with an annular groove at the center. The belts are kept taut by a roller resting upon their lower parts. A brush, which can be raised or lowered as required, is so journaled in the frame that its surface projects slightly above the tops of the rollers. This brush is driven by a belt from one of the end pulleys. On the outer surface of each side piece of the frame is pivoted a lever, the upper ends of which are united by a bar and the lower ends are provided with balancing weights. Between the upper ends of the levers is pivoted a brush, the shaft of which carries a pulley on one end. A belt from this pulley passes over a pulley on the shaft on which the levers are mounted, and the latter pulley is driven by a belt from the shaft of the lower brush.

The operation is, briefly, as follows: The main drum



BEKOFSKY'S BRUSHING MACHINE.

is revolved either by hand or by a belt. The coat or other garment is placed on a coat hanger bar, and placed on the rollers in such a manner that the hook of the bar catches on the bend of one of the cross rods. The garment is pulled between the brushes, which brush it thoroughly on both sides. The upper brush swings up more or less as the garment passes. When the coat hanger bar reaches the driving drum, it is disengaged automatically.

This invention has been patented by Mr. V. S. Bekofsky, of Jenchuan, Corea.

JAR COVER.

The cover, which is about the same diameter as the rim of the jar, is made of wood rendered waterproof by varnish or paint. To opposite edges are secured wire fasteners made of iron or steel spring wire, copper coated, or of brass wire. The form of these wires is clearly shown in the engraving. The cover is placed on the jar by bringing one of the spring fasteners into engagement with the under side of the rim of the jar, then pulling the other fastener until it will pass over the rim, then pushing down the cover and releasing the second fastener, which will engage with the rim. The cover is removed by pulling out one of the fasteners. The cover can be made to fit any size jar. This invention has been patented by Mr. W. F. McFarland; particulars can be had from Messrs. McFarland & Rowles, of Pleasantville, Ohio.

The United States Cotton Harvester.

The United States Cotton Harvester, invented by Mr. Owen T. Bugg, of Georgia, was recently exhibited in operation at the New York Cotton Exchange. In spite of certain disadvantages arising from the slipping of the wheels on the polished floor, and the brittleness of the dried cotton plants, the trial was pronounced successful by the planters in attendance. The cost of harvesting the lint by hand is at a low estimate $10 per bale, while with this machine the inventor states that the cost will not exceed $1 per bale. Should he be able to realize these figures in practice, the innovation will be of great importance to the entire cotton-growing district.

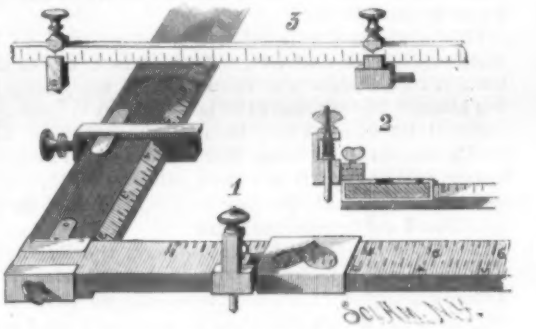
Honor to Whom Honor is Due.

Mr. Alvan Clark, of Cambridge, Mass., the famous telescope maker, has received from the Czar of Russia the honorary golden medal of the empire, "in acknowledgment of the excellent performances of the great object glass" made for the chief telescope in the Pulkowa observatory. This medal is seldom bestowed, and only for extraordinary merits.

GLASS CUTTING GAUGE.

By means of this gauge, panes of glass can be cut at true angles or on curved lines, exactly and rapidly. On one end of the main part of the gauge is a clamp for holding the tongue in place, as shown in Fig. 1. Mounted on the tongue is a slide, having a recess in its top; in the edge of the recess is formed a pointer, which indicates the position of the slide on the scale on the outer edge of the tongue. On the upper surface of the slide is a projection having an aperture for receiving a pin projecting from a block, as shown in Fig. 2. The diamond for cutting the glass is held on the lower end of a rod passing through this block, a spiral spring pressing the rod downward. On the main part of the gauge is a guard which can be locked in place, thereby facilitating the cutting of large quantities of glass of the same size. To cut along the edge of the tongue, the slide is moved, the spring permitting the diamond to give more or less where there is any unevenness in the glass. To cut the glass on curved lines, the block shown in Fig. 1 is removed, and that shown on the right of the sweep, Fig. 3, is adjusted on the slide mounted on the tongue. The sweep, which is provided with a diamond carried by a sliding clamp, is then swung to describe the desired circle, the center of the glass being located by the pointer on the edge of the recess in the slide on the tongue.

This invention has been patented by Mr. E. O. Boyle, of Chateaugay, N. Y., who will furnish all further particulars.



BOYLE'S GLASS CUTTING GAUGE.

AN ENGLISH STERN WHEEL STEAMER FOR THE NILE.

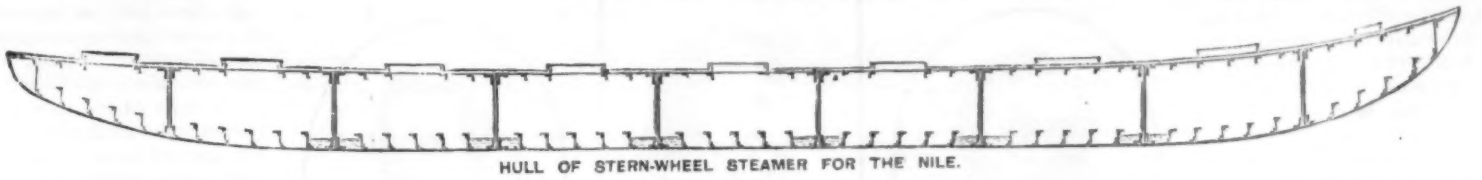
Stern wheelers have of late come very prominently before the public in consequence of the success which attended those built by Messrs. Yarrow & Co. for the Nile expedition. It will be recollected that in the latter part of 1884 the Government determined to immediately advance upon Khartoum. Had steamers been available at the time, suitable for the navigation of the Nile, they would undoubtedly have been adopted; but such not being procurable, the authorities resorted to the now well-known rowing boat system. There was, however, a stern wheeler partly finished in Messrs. Yarrow & Co.'s yard at Poplar, which was being constructed for a South American firm, and this the Government purchased. Immediately after she was shipped, the War Office ordered an exact facsimile to be put in hand and finished with all speed, and it will be remembered Messrs. Yarrow & Co. completed her in the remarkably short period of seventeen days. These boats were 100 ft. long by 18 ft. beam, drawing 18 in. water. One of them was put together above the second cataract near Wady Halfa, and was ultimately named the Lotus.

This design of steamer having proved so great a success, Lord Wolseley desired the Government to immediately contract with Messrs. Yarrow & Co. for eight more, which were forthwith proceeded with, and one of these forms the subject of our illustration, which has been engraved from a photograph taken in Egypt. Some of them were fitted up as gunboats, and some for transport purposes. A large gun was placed on the upper deck, forward, commanding, from its elevated position, a good range over the river banks. There were also eight Nordenfelt guns, having shields in front of them, in various parts of the vessel, placed so as to receive an all-round fire. Forward, on the lower deck, is a shot-proof house capable of accommodating eight riflemen, and high above the rest will be seen the conning tower, from whence the navigation is directed.

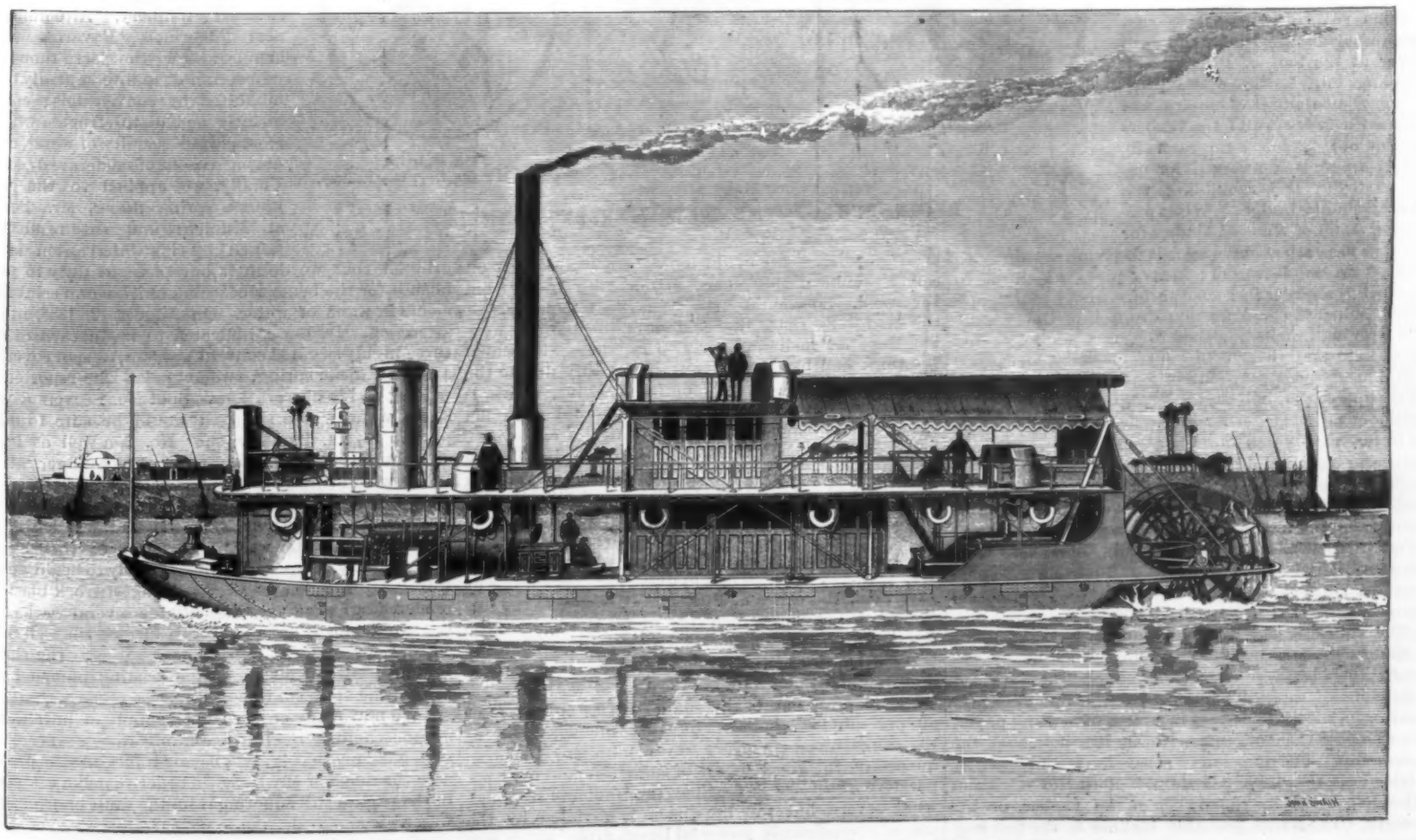
In order to secure economy of fuel, which is very scarce in Upper Egypt, the engines were compound surface condensing, and the boiler, which was of the locomotive type, was arranged either for burning wood or coal, it being provided with a fan and closed ash pan, to be utilized at times when an extra supply of steam was needed to ascend any specially rapid part of the river. Under ordinary conditions of working, however, a forced draught was not used, so as to avoid the wear and tear of the boiler.

The general arrangement of the cabin accommodation is clearly seen from the engraving.

There is one point about the construction of the hulls which is deserving of special notice, namely, the manner in which they are designed, with a view to being put together with the greatest possible rapidity. To fully explain the system, we refer to the accompanying engraving. The hull is divided into several transverse sections, each section having water-tight bulkheads at both ends. When afloat, they draw 6 in., and are of a size suitable for easy shipment in a vessel's hold, and of



HULL OF STERN-WHEEL STEAMER FOR THE NILE.



AN ENGLISH STERN WHEEL STEAMER FOR THE NILE.

being readily handled and transported overland. The sections were conveyed to their destination at Cairo, there lowered into the river, and immediately united together afloat. The angle iron which joins the transverse bulkheads to the skin plating is of larger size than the rest of the frames, to admit of a number of holes through which bolts may be passed to join the sections together. It will be seen that the floor plates, being 15 in. deep, are of such a height that although the water will pass through the holes in the bulkheads, it cannot rise to so high a level as to flow over into the interior of the section, which therefore remains afloat. This enables the bolts to be passed through and to be tightened up, uniting the sections firmly together; when this is done, the small amount of water left can be easily pumped out.

This mode of construction has been found to be highly successful, and, as a matter of fact, one of the hulls of these boats was connected up completely in five hours. There seems to be no deficiency in strength incurred by this system, because the nature of the strains thrown upon these stern wheelers is of such a character that there is always a compression throughout the entire hull, tending to keep the sections together and not to separate them.

It is a fact not generally known, says the *Engineer*, that for a certain indicated power a stern wheeler gives a somewhat greater efficiency than a side wheeler. Not only does the design enable an exceptionally light hull to be built with ample strength, but the position of the wheel is specially favorable, because, as pointed out by Mr. Wm. Denny, it acts upon the water at a point where it has a definite forward motion, *i. e.*, at the top of the following wave. It also lends itself to an arrangement of steering gear by means of three or four rudders placed between the wheel and the hull, which secures a maneuvering power impracticable with any other mode of propulsion. This is, however, particularly the case when going astern, which is an essential condition necessary to be complied with in shallow river navigation. The disadvantage to this system as compared with screws is that the engines are, for a given power, of greater weight on account of their slow movement. This would no doubt be a consideration in navigating those rivers where skilled labor is available and repairs easily executed; but in those parts of the world, as on the Upper Nile for example, where such is not the case, the slow moving machinery is, beyond all doubt, far more trustworthy and less liable to derangement or early depreciation from wear and tear. Moreover, the entire machinery is accessible for repairs while the boat is afloat, every part being above the water; while, on the other hand, with a screw propelled steamer, should its propellers or shafting get bent or broken, which in such navigation is likely to occur, it involves lifting the stern of the vessel out of the water or placing it in a dry dock—conditions which it is impossible to comply with in many foreign places.

A Curious Savings Bank.

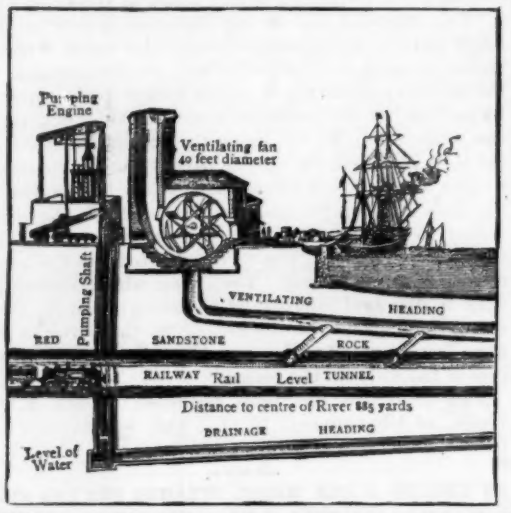
Some years ago, an old wooden bridge spanned the Schuylkill River at the foot of Penn Street, Reading, Pa. In the course of time a more substantial structure was deemed necessary, and the timbers of the old bridge were carefully taken apart, and reserved for use in repairing and rebuilding the smaller county bridges. While preparing some of this old timber for its new use, a few days ago, it became necessary to saw off several feet from a heavy piece, which was to be used as a girder in a small bridge under contemplation. When the end portion dropped to the ground, the workman was astonished to hear a jingling sound as of gold and silver coin. A summons of such good omen insured a speedy investigation, which resulted in finding eagles, half eagles, silver dollars, halves, and quarters mixed together in careless confusion. The source of supply was found in a section about eighteen inches in length and five inches deep, which had been hollowed out of the log with auger and chisel. An inch thick cover had been fitted over the opening so cleverly and sealed with so much care that detection, other than accidental, was hardly possible. The treasure had been confined in a home knit woolen stocking, and as the saw cut off the toe, a part of the contents was discharged.

The value of the deposit, though reported to be considerable, was not made public. The money was probably hidden away a number of years ago, as specimens of three, five, ten, twenty-five, and fifty cent scrip, nicely folded up in a piece of writing paper, were among the contents. Not a line indicated the ownership. The question of possession is consequently divided as to whether it should go to the workman who discovered it, the owner of the timber, or the county. The finder probably inclines to the first suggestion.

THE MERSEY TUNNEL.

(*Continued from first page.*)

for the construction of a tunnel under the Mersey was introduced into Parliament. Commercial panics and the opposition of vested interests, however, prevented its passing until 1871. Even then the work was languidly supported, and it was only in 1879, when an arrangement was made with Major Isaac, that the work began to advance. Since that time the organization has been so perfect that progress has been unceasing, and among 3,000 men constantly employed, no death has occurred for which a coroner's jury has blamed the company or the contractor.



SECTION SHOWING RELATIVE POSITION OF RAILWAY TUNNEL, DRAINAGE AND VENTILATING HEADINGS.

The Ventilating Fan draws the Air from the Tunnel under the River at any Desired Point.

The initial boring experiments showed that there was an almost uninterrupted stratum of red sandstone beneath the bed of the river, and through this the tunnel has been made. Though no actual inundation occurred, the percolation of water, owing to the porous nature of the sandstone, proved a source of considerable difficulty. This was removed, however, by the gigantic pumps erected at both ends of the tunnel, of which we give illustrations. They were kept constantly going, and were capable of delivering 300 gallons per stroke. On the 17th of January, 1884, little more than four years after the undertaking had been regularly taken in hand, the workmen on the Birkenhead side shook hands with those from Liverpool. So accurate had been the calculations of the engineers, that the centers of the borings were less than an inch apart. The rapidity with which the work had been carried out was greatly due to the use of Colonel Beaumont's boring machine, which is driven by compressed air, and scoops out a tunnel seven feet in diameter; large quantities of explosives, however, were also employed in the excavations. The tunnel, which is laid with a double line of rails, is well drained and ventilated. The ventilating tunnel, 7 feet 2 inches in diameter, is placed parallel to the main tunnel, and at a distance of about 20 feet from it. The ventilation is accomplished by means of fans. Two of these, each 40 feet in diameter, placed, one at Liverpool, the other at Birkenhead, ventilate the section of the tunnel which lies under the bed of the river, while two smaller fans purify the air in the two extremities of the tunnel which lie beneath the land. When these four fans are all at work at once, they can draw out of the tunnel 600,000 cubic feet of air per minute, thereby changing the whole air of the tunnel once in every seven minutes. In consequence of the great depth of the river, and the comparative shortness of the line, the gradients are somewhat severe, but this drawback is obviated by the use of exceptionally powerful locomotives, which will perform the journey between Liverpool and Birkenhead in less than four minutes. At either end lifts capable of raising a hundred persons at a time have been erected, so that there will be very little delay in getting from the streets to the railway which lies so far beneath them. The tunnel is already in full working order, and trains run freely through it. On the Cheshire side it is joined by the Great Western Railway system. All that now remains to be done is the connection of the tunnel railway with the Lancashire railway system.

Mr. C. Douglas Fox, Engineer to the Mersey Tunnel.

Mr. James Brunlees, Engineer to the Mersey Tunnel.

Mr. A. H. Irvine, Resident Engineer, Mersey Railway.

ENGINEERS OF THE NEW MERSEY TUNNEL.

Well Finding.

In the London *Times* of February 9, 1885, appeared the following paragraph: "The *Allgemeine Zeitung* gives some interesting particulars of remarkable success in indicating the presence of water springs on the part of a man named Beraz, who seems to be a recognized authority in such matters. The scene of his performance was in the Bavarian highlands, at a height of more than 1,300 ft. above the level of the sea. The commune of Rothenberg, near Hirschhorn, suffered greatly from want of water, and invited Beraz, last autumn, to endeavor to find some source of supply for them. He inspected the locality some afternoon in the presence of the public authorities and a reporter of the *Allgemeine Zeitung*, and announced that water was to be found in certain spots at depths which he stated.

The first spot was in the lower village, and he gave the likely depth at between 62 ft. and 72 ft., adding that the volume of water which the spring would give would be about the diameter of an inch and a quarter. After incessant labor for four weeks, consisting mainly of rock blasting, the workmen came on a copious spring of water at a depth of about 67 ft. What he declared about a water source for the upper village was very singular. He pointed to a spot where, he said, three water courses were perpendicularly under one another, and running in parallel courses. The first would be found at a depth of between 22½ ft. and 26 ft., of about the size of a wheaten straw, and running in the direction from S.E. to N.W. The second lay about 42 ft. deep, was about the size of a thick quill, and ran in the same direction. The third, he said, lay at the depth of about 56 ft., running in the same direction, and as large as a man's little finger. The actual results were as follows: The first water course was struck at a depth of 27½ ft., running in the direction indicated, and having a diameter of ¼ in. The workmen came on the second at a depth of 42⅔ ft. It had a diameter of $\frac{7}{16}$ in. The third was found at 62½ ft. below the surface, and having a diameter of ⅜ in.—all three running in the direction Beraz had indicated. Unfortunately, no hint is given of his mode of procedure."

We have just received from Herr Beraz the following translation from the *Allgemeine Zeitung*, which we give *verbatim et literatim:*

"In spite of the most expensive machinery of pumps we did hitherto not succeed in securing an abundant water supply for our highly situated nunnery, Altomunster, near Roehrmoos, Bavaria, which has now—for the last thousand years—almost uninterruptedly been inhabited by conventuals; consequently we had to struggle with a most painful scarcity of water, even during seasons of moderate dryness. Finally, we applied to the well known spring finder, Mr. Beraz, at Munich; and the result obtained by his intercession is so brilliant that we deem it our pleasant duty to publish it for the benefit of communities and establishments in want of water. On August 12, 1885, in the afternoon, Mr. Beraz indicated to us, in each of our three highly situated convent gardens, a spot covering a subterranean spring; two hours later he reported in writing on his observations. Spot No. 1 covers a well 80 cm. wide, whose strength would be sure to fill a pipe of 1½ in. diameter; spot No. 2, a well as large as a thumb; and No. 3, one as large as a finger, all of which would surely be found at a depth of between 28 and 30 meters, and flowing in the direction from E.S.E. to W.N.W. No external symptom had ever led us to suppose that water was to be found on these spots. Our calamity compelled us immediately to begin at the spring No. 1, indicated as the strongest; rock blasting rendered our work very difficult for several weeks; at last we found, at a depth of 29½ meters, the well indicated, pouring forth crystalline water into the shaft. Careful trials by means of the existing pumps have proved the volumen to be 1½ in.

"We now really enjoy a good supply of pure water for household, agricultural, and piscatory purposes, to such a degree that it gives us much pleasure to propagate the name of Mr. Beraz in order to make it known to the parties still suffering from the want of drinkable water.

"Convent Altomunster, December 9, 1885.

"M. Maximiliana Hirschauer, Prioress, Ord. St. Birg."

Correspondence.

Putting Boilers in Rowboats.

To the Editor of the Scientific American:

I notice a sub-committee of the Committee on Commerce of the House of Representatives has been appointed to recommend some special legislation in regard to yachts. Would it not be well to get some official decision as to what constitutes a "vessel" under the law making rules for the government of "vessels propelled in whole or in part by steam," which I think is the phraseology of the law?

I have a rowboat, and conclude to put a one horse engine in her, and do so. Until then she was a "skiff," and the eye of the law knew her not. With this simple addition I am notified she has become a "vessel," and more officials than she can possibly contain demand that I shall immediately, under heavy penalties for non-compliance, take out a license for a pilot, engineer, and captain. My boiler must be of a particular style, and so must be the safety valve. I must carry so many "floats," an ax, water pails, lanterns, and an anchor, and must post up my licenses in some designated place, which shall be conspicuous.

I find it impossible to comply with these requirements; remove my engine, depend upon the "white ash breeze," and the eye of the law closes upon my being.

Should a craft of limited size, carrying neither passengers nor freight, used solely for private purposes, be subject to the rules regulating our steam commercial marine? CHARLES DOTY.

Alton, Ill., Feb. 17, 1886.

Tricks of Microscope Venders.

To the Editor of the Scientific American:

Venders of cheap microscopes continue to play tricks upon the unwary. I will give you the secret. They use a small particle of sour paste, pretending it is a drop of water, and the objects shown are *anguilulæ*, or paste eels. The following is the method of working the trick:

The vender has standing before him on the stand with his instruments a glass of clear water, usually containing a bit of ice. The instruments consist of a short fenestrated brass tube carrying two plano-convex non-achromatic lenses, one of which is about 1·0″ and the other 0·5″ focal length, and so arranged that the visual focus falls on the plane surface of the smaller lens. Besides the instruments and a glass of water, a *number of* clean wooden toothpicks lie carelessly scattered on the stand. On a little bench under the table, and concealed from public view, there is a small box of sour paste, plentifully supplied with anguilulæ.

When a customer steps up, the chances are a hundred to one, as every microscopist knows, that his first question will be, "Does this here show the animalcules in water?" The ready answer is, "Show 'em? Certainly! Fact is, I don't dare to look at the water. *I* keep melted ice water for my use. That generally ain't got many." "Has that water got any in it?" continues the querist. "We can see," says the vender, and he picks up a clean toothpick, dips it into the glass, and prepares to put a drop on the front lens. His hand, however, is shaky, and the toothpick drops, falling generally on the little shelf which projects slightly from under the table. He picks it up again, and under pretense of wiping it sticks it into the paste, gets a very minute particle to adhere, again touches it to the water, and smears the front of the field or objective lens.

The victim then looks, and is amazed and delighted, and straightway invests in a 'scope, paying from one to two dollars for what costs the vender less than fifteen cents ($1.75 per dozen).

This ingenious piece of rascality was the invention of a man who formerly made his headquarters in Pittsburg, Pa., and who, for years, has derived a large revenue from this and similar "fakes" gotten up for the use of street venders, who either pay him a royalty on their use or buy outright the privilege of using them. I was told by three different individuals that they paid this man fifty dollars each for the secret of this "fake," but that, not being able always to find paste which contained eels, they were also compelled to purchase from him at a large price some "starting" or cultivating fluid. All sour paste does not contain the anguilulæ; vinegar eels are sometimes used, but only when the cultivated paste eels cannot be gotten, as they are too large—one of them frequently stretching entirely across the field of vision. The eels raised in paste without the use of this fertilizing fluid are much larger than those obtained by its aid.

The number of educated people who are caught by this trick is really astonishing to one who habitually uses the microscope. A street vender here tells me that he has repeatedly sold 'scopes to physicians whom he had fooled into believing that the instruments possessed amplifying power sufficient to enable them to distinguish blood and pus corpuscles, and even bacteria. FRANK L. JAMES, PH.D., M.D.,
Pres. St. Louis Soc. Microscopists.

St. Louis, Feb. 16, 1886.

Closing the Straits of Belle Isle.

To the Editor of the Scientific American:

In a recent issue of your paper, Mr. John C. Goodridge suggested a novel way of elevating the temperature of the New England States and the Dominion maritime provinces. The polar current, running southward through the Straits of Belle Isle, interposes a cold wall between the North American continent and the Gulf Stream. By building a dam across the straits and shutting off this current, Mr. Goodridge imagines that the Gulf Stream would hug our shores and give us a climate similar to that of Great Britain.

But if we consider the *cause* of the polar currents—why they move down from the high latitudes on the eastern coast of America, but *do not* on the western coast of Europe and Africa—it will be seen that Mr. Goodridge's philosophy is unsound.

It is well known that when warm water is in the act of cooling it undergoes contraction till within a few degrees of the freezing point, so that a cubic foot of cold water is heavier than a cubic foot of warm. Hence it is found that even under the equator, where the water is warm on the surface of the ocean, at the depth of two or three hundred fathoms it is several degrees below the freezing point. The cold water being heavier sinks to the bottom, so that even the Gulf Stream has an Arctic bed of water beneath it.

In consequence of the difference in the specific gravity of the polar and tropical oceans, there is a constant pour of waters from the northern regions southward, and a corresponding movement of the displaced equatorial waters northward.

But why does this cold south bound current run close along the American shore, while the warm currents are crowded eastward? In other words, why is the ocean on the west coast of Europe and Africa warmer than on our eastern coast? For the same reason that the cold Arctic water occupies the bed of the ocean, even under the equator, while forcing the warm water upon the surface. Because it is heavier. The earth's diurnal motion toward the east imparts a tendency to bodies on the surface to move westward, as seen, for instance, in the polar currents taking a westerly course when approaching the equator; and hence the cold water, being heavier, is always found on the eastern shores of the continents. Hence the cold climate of Labrador and the warm climate of England in the same latitude; the cold climate of eastern China and the warm climate of British Columbia. Damming the Straits of Belle Isle, therefore, could have no effect in warding off the Arctic current or bringing the Gulf Stream nearer to us. So long as our planet's diurnal motion exists, so long will a cold Arctic current run southward along the east coast of China and the east coast of North America.

But, admitting that Mr. Goodridge is correct, would it pay to dam the Straits of Belle Isle? It would not, for the effect would be the destruction of our fisheries. There are few fish, and none that are good, in the warm waters of the Gulf Stream, our fisheries being confined to the cold waters of this Arctic current, which Mr. Goodridge is so anxious to shunt off into mid-Atlantic.

E. STONE HIGGINS.

Ottawa, March, 1886.

"Fire from Steam Pipes."

To the Editor of the Scientific American:

A pertinent article, under this heading, appears in your issue of January 16 last.

I am of opinion, from practical experience, that hot water pipes in contact with woodwork are dangerous, and I only wonder that insurance companies do not refuse to insure where the necessary precautions are not taken to isolate pipes sufficiently to prevent danger, which, as I shall presently show, it is so easy to do. During soft weather, steam and hot water pipes become very hot from the surrounding air being too warm to relieve them of or abstract their heat, as colder air does. On one occasion this winter, a very soft day, my steam boiler had raised the temperature throughout all the pipes about the house to such a scorching heat that everywhere the woodwork was very hot, and I could not bear my hand on any portion of it without burning it, as if I held it on a hot stove. It is only two or three weeks ago that a towel laid across the coil in a room on the third floor of the house was actually scorched, as if by a red hot iron, and this has happened more than once.

True, water heated under atmospheric pressure only attains to a heat of 212° Fah., or 100° C.; but in a five story house, with even an open well or cistern in the garret above—a height, say, of 50 feet, equal to a pressure per square inch of nearly 22 pounds—the water, of course, reaches a much higher temperature, as it does in any closed vessel; and if to this be added the additional pressure or resistance in the rising mains due to the retardation by friction through long stretches of pipe with numerous right angled bends, it is easy to understand how the temperature required to force the column of water along may be increased so as to become exceedingly dangerous.

Partly on that account, and to prevent the motion due to continual expansion and contraction from breaking the plastering, as it always does through walls, partitions, and ceilings when the undermentioned precaution is not taken, I specify that the holes for the steam or hot water pipes are to be bored so much larger than the pipe (a quarter of an inch is sufficient) as to allow of inserting a sheet iron or, better still, a tin tube, leaving a space of say one-eighth of an inch all around the pipe, with two or three little tacks or stone or iron wedges between them to keep the hot pipe from contact with the outer metallic ring.

Bright, clean tin is the best thing that can be used, as, when not in contact, it never heats. So true is this that, when used as a screen around a red hot coal stove, though not an inch therefrom, it reflects back all the rays of heat thrown upon it; you can touch it with impunity, and it actually feels not even warm, but comparatively cold or cool.

The precaution I advocate is extremely simple, and in no way costly. It can cost nothing to bore the holes through skirtings, studding, floors, etc., the fraction of an inch larger, and $5 or $10 in any house would cover the whole cost of the pieces of tin or iron pipe required for the purpose of insulation.

CHS. BOILLOIRGE, M.A., F.R.S.C., etc.,
City Engineer, Quebec.

French Academy Prizes for 1886.

The following are among the prizes offered this year by the Paris Academy of Sciences:

Geometry: A study of the surfaces admitting all the symmetrical planes of one of the regular polyhedrons—3,000f.; Francœur prize, the work most conducive to the progress of the pure and applied mathematical sciences—1,030f. Mechanics: Extraordinary prize of 6,000f. for any work tending most to increase the efficiency of the French naval forces; Montyon—700f.—invention or improvement of instruments useful to the progress of agriculture, of the mechanical arts or sciences; Plumey—2,500f.—improvement of steam engines or any other invention contributing most to the progress of steam navigation; Dalmont—3,000f.—the best work by any of the Ingenieurs des Ponts et Chaussees in connection with any section of the Academy. Astronomy: Laland prize—gold medal worth 540f.—for the most interesting observation on work most conducive to the progress of astronomy; Damoiseau—10,000f.—best work on the theory of Jupiter's satellites, discussing the observations and deducing the constants contained in it, especially that which furnishes a direct determination of the velocity of light; Valz—460f.—for the most interesting astronomical observation made during the course of the year. Physics: Grand prize of the mathematical sciences—3,000f.—for any important improvement in the theory of the application of electricity to the transmission of force. Statistics: A prize of 500f. for the best work on the statistics of France. Chemistry: Jecker prize—5,000f.—for the work most conducive to the progress of organic chemistry. Geology: Vaillant prize, on the influence exercised on earthquakes by the geological constitution of a country, by the action of water, or of any other physical causes.

The Singer Sewing Machine Company.

The Singer Sewing Machine Company have in the United States 1,500 offices, the business being transacted from twenty-two centers, located in the large cities.

The Canadian business is similarly managed from two central offices, one at Montreal and the other at Toronto. The London (England) office controls immense interests, including South America, middle and northern Europe. The western Asia business is controlled from Hamburg, Germany, under the charge of Herr Neidlinger, one of the best managers in the Singer service. Most of the woodwork is made at the South Bend, Ind., factory.

This company have several factories. One at Elizabeth, N. J.; one at Montreal, Can.; one at Killbowie, Scotland; and one at Vienna, Austria, the latter intended to supply the trade of Russia, Turkey, and eastern Asia. The total number of company offices throughout the entire world is something over 4,500. In fact, says the *Journal*, it is the largest industrial company in existence.

Danger of Chloral.

At a recent meeting of the Cincinnati Academy of Medicine the uses of "chloral" as a remedy were pretty thoroughly discussed. The experience of the profession seemed to be that "chloral was an uncertain and treacherous remedy." Some persons are more affected by a dose of four grains than others are by a dose of twenty grains. Cases were reported where 200 grains per day had been given, and one case, reported by Dr. Beck, of the Baden army, where 430 grains were given in three and a half hours, the patient sleeping for thirty hours and recovering. The profession also agreed that chloral cannot successfully be administered hypodermically. There were cases reported also where death was caused by the administration of ten or twenty grain doses, and where dangerous symptoms resulted from a single five grain dose. Such a remedy cannot be regarded less than dangerous in any except the most skillful hands.

Submarine Torpedo Boats.

On this subject Mr. Nordenfelt lately read an interesting paper before the Royal Service Institution, London, from which we take the following points relating to his new submarine boat, illustrated in the SCIENTIFIC AMERICAN of November 7, 1885.

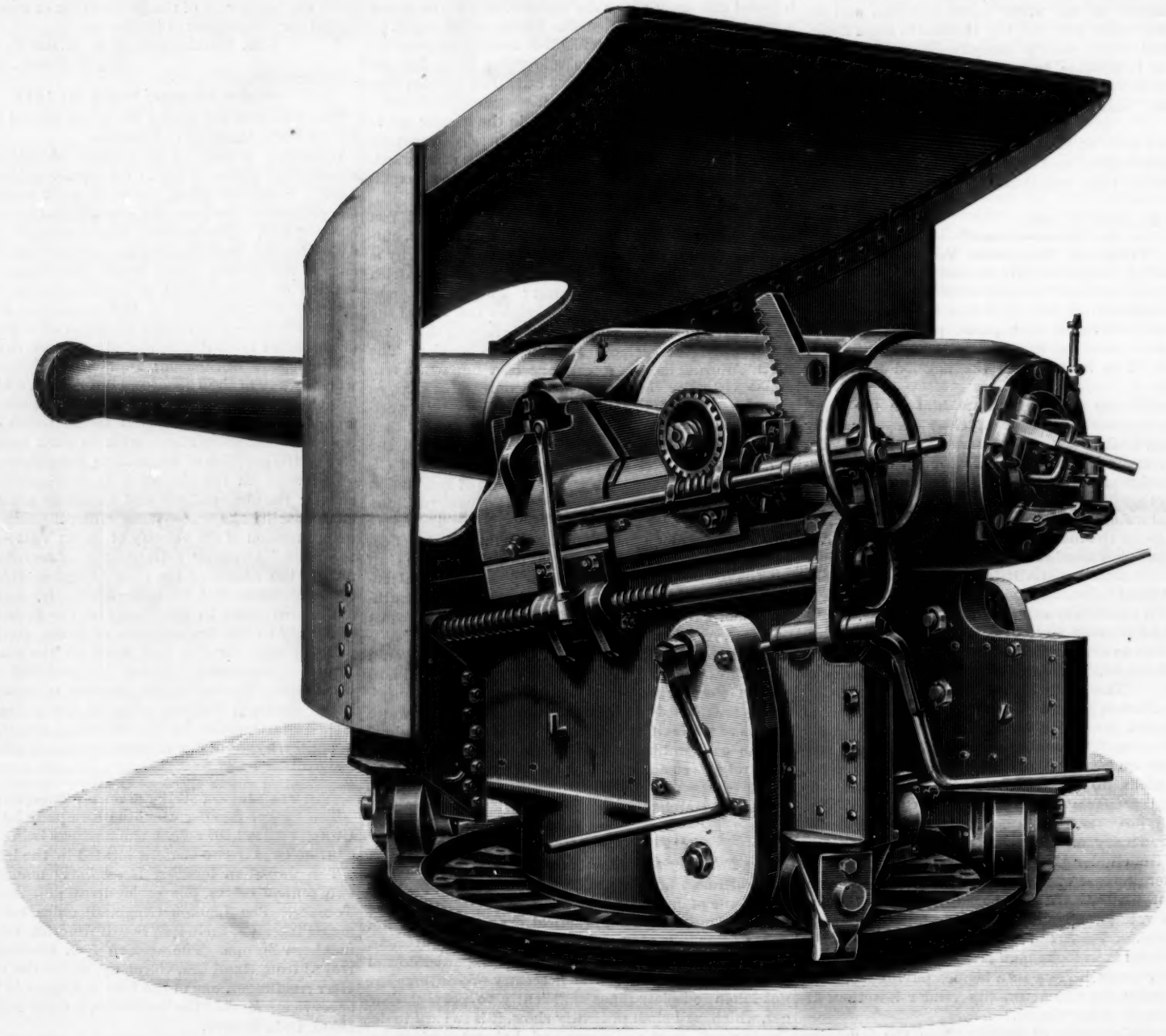
This fast boat was 64 feet long, 9 feet beam, over sponson 12 feet, with 60 tons displacement, and 100 horse power engines. Speed, 9 knots, capable of going 150 miles without recoaling. It carried a fish torpedo outside, to be discharged mechanically. It is intended to run on the surface, but blowing its smoke out under water, till it nears an enemy, when it descends and moves "awash," with a cupola alone above water. When this is liable to be seen, she descends altogether under water by means of propellers. The vessel is kept in the horizontal position longitudinally by means of rudders in the bow, which by the action of a plumb weight bring the boat back to this position should anything suddenly make her leave it.

Three features are specially emphasized by Nordenfelt: (1) The employment of heated water to give off steam as an unfailing reservoir of energy. (2) The submersion of the boat by mechanical means, which is much safer than depending on specific gravity, because practically the density of water alters so slowly with the depth that a vessel that descends below the surface may descend to a great depth. The horizontal position protects the boat from dangerous impetus downward, and the mere cessation of working the special propellers causes the boat to rise. (3) The use of rudders to keep the vessel always horizontal. There is no difficulty as to sufficiency of air and heat. After fourteen miles run, when the crew had been inclosed for three hours, the temperature was only 32° C., or 90° F., and a tallow candle even on the floor burnt without visible diminution. The turtle back of the boat can be protected against machine or quick-firing guns by an inch steel plate, but it is so oblique to the direction of fire that it would, Mr. Nordenfelt believes, resist it without. When "awash," the water would protect the vessel. Two Whitehead fish torpedoes are carried, but more is expected from an electrical controlled torpedo, which would push in any protecting netting, and would fire 300 pounds of dynamite. There is a quick-firing 2-pounder for use against torpedo boats if necessary. Finally, Mr. Nordenfelt prognosticated the employment of such boats in the defense of channels all over the world, declaring them to be most sober, business-like affairs, although they might be suggestive of the conceptions of Jules Verne.

It may be well for our naval people and Congressmen to consider the points here given before they waste millions of dollars upon great hulks for a new navy.

TEN INCH BREECH LOADING NAVAL GUN.

Our illustration, which is from *Engineering*, shows a ten inch breech loader with Vavasseur carriage, complete with all the latest appliances for rapid firing and quick change in the direction of the cannon. When we compare one of these guns, with all their attachments of levers, cog wheels, screw gears, etc., with the simple great guns of twenty-five years ago, it will be seen that mechanical ingenuity has greatly advanced; probably the efficiency of the gun itself has been correspondingly improved. In a future number we intend to refer to the subject again.



TEN INCH BREECH LOADER GUN WITH VAVASSEUR CARRIAGE.

Sinking Tubular Foundations with Dynamite.

Le Genie Civil, in describing the construction of the Palma bridge over the Guadalquivir River in Spain, notes the use of explosives in sinking several of the tubular piers.

Work was commenced in the spring of 1884 upon the foundations, and compressed air was employed on the first pier, which was made up of two cast iron columns, each 8 feet in diameter. But progress was interfered with by frequent rises in the river to the extent of 16 to 18 feet, and by the fact that the depth to hard bottom was only about 34 feet below the water surface, and the heavy counterweight thus required to overcome the lifting effect of the compressed air was awkward to handle under the controlling conditions.

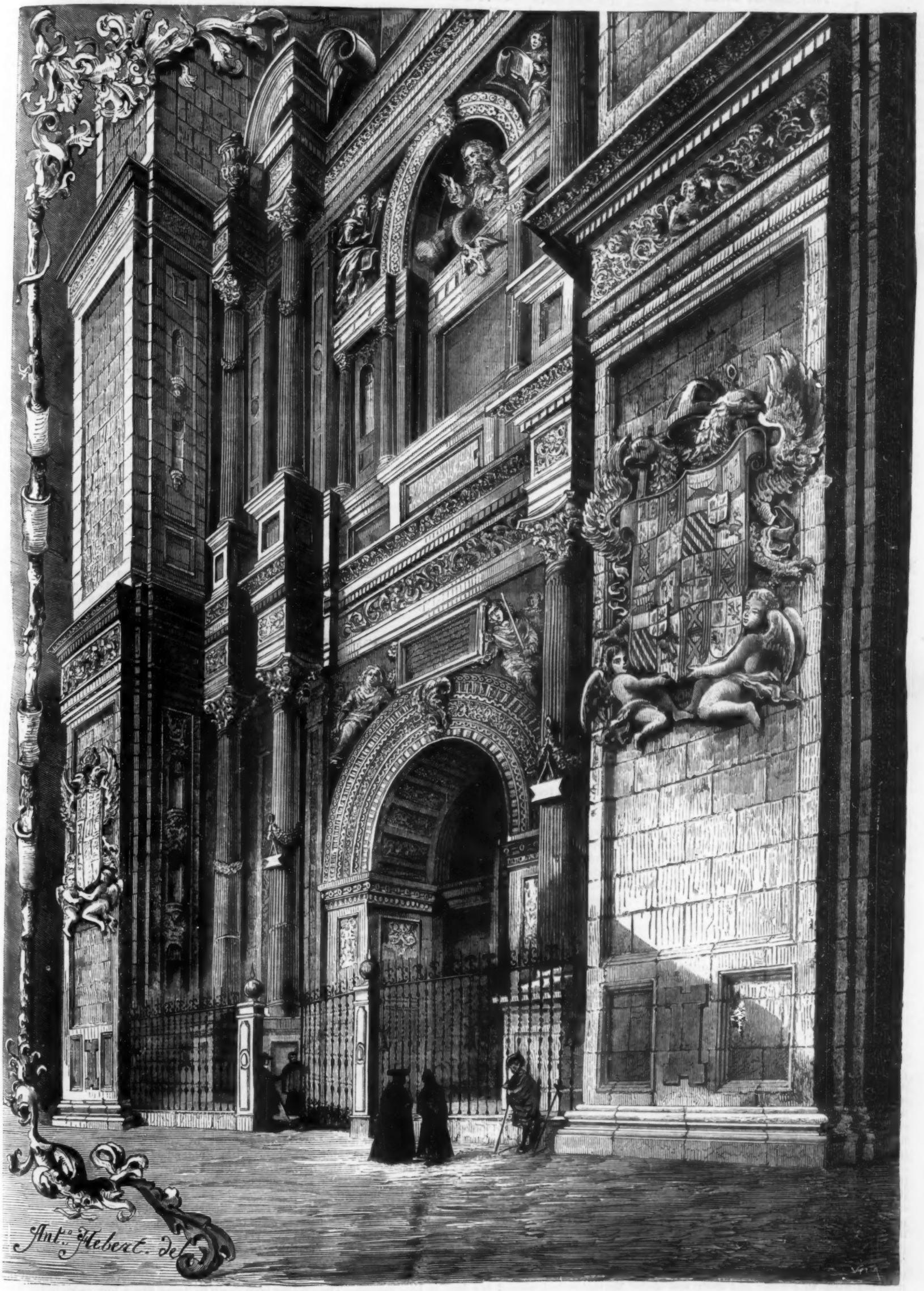
M. Jardin, the engineer in charge, finding it impracticable to increase the weight, conceived the idea of employing dynamite as an aid in sinking his piers. His method was as follows: The cylinder being cleaned out and all made ready for a "sink," holes were bored horizontally out under the cutting edge, and cartridges of dynamite inserted. Wanting electrical apparatus, the firing was done by fuse cut to a length sufficient to permit the men to escape from the cylinder, which was filled with water before firing. The simultaneous explosion of the cartridges produced the intended effect, and the process was repeated until the desired point was reached.

M. Jardin claims that this method may be applied without danger, provided that the cartridges are placed as far as possible away from the cylinder, which would otherwise be broken. The effect upon the soil was comparable to a light earthquake shock, at times accompanied by jets of water thrown up around the pier; but more frequently, with depths of 27 to 30 feet of earth, the gases of explosion escaped into the interior of the tube without making any outside demonstrations.

THE CATHEDRAL OF GRANADA.

A good idea of the architectural beauties presented by some of the old Spanish churches may be gathered from an examination of the picture of the Perdon entrance or doorway of the Cathedral of Granada, herewith presented, and for which we are indebted to *La Ilustracion Espanola*. The first stone of this great edifice was laid March 15, 1529, with solemn ceremonies. The architect was Diego de Syloe; he died long before the completion of his great work. Over a hundred years elapsed before it was finished.

We have in this design the variety and profusion of adornments which are so characteristic of the Renaissance. The elegant arches adorned with the richest mouldings; the figures of Justice and Faith, which sustain a Latin inscription, written by the confessor of Queen Isabella; the airy columns that rise at the sides, girdled with floral wreaths and crowned with capitals at whose corners appear little faces from between thistle leaves; the magnificent frieze and the shaded cornice of its entablature; the grand shield of arms carved on the two salient pillars; the delicate proportions of the second division, which give character to the figures of Moses, of David, and the Eternal Father—all that Syloe left complete—contribute to render this work one of the most faultless creations of ornamental architecture.



THE CATHEDRAL OF GRANADA—THE PERDON DOORWAY.—FROM A DRAWING BY ANTONIO HEBERT.

PHOTOGRAPHIC NOTES.

Making Lantern Slides on Dry Plates.—From a paper read recently by B. J. Edwards before the Photographic Society of Great Britain, and published in the *British Journal of Photography*, on the above subject, we extract the following interesting particulars:

For contact printing from negatives of a suitable size, the gelatino-chloride process will be found especially suitable; it also has the further advantage that it is extremely easy to work.

This beautiful process was first described by Dr. Eder, of Vienna, who exhibited at the Technical Exhibition held in 1881, at the Society of Arts, in London, a series of fine transparencies made by the new process.

In April of the following year I had the honor of demonstrating the process before the South London Society at the same place, and I also introduced gelatino-chloride plates commercially in this country.

Since that time many improvements have been made. Dr. Eder's formula for gelatino-chloride emulsion was published, with instructions for modifying it in preparation so as to produce various tones in the transparency. Dr. Eder also published his formula for development by means of citrate of iron. Then came Captain Abney's ferrous citro-oxalate developer, which was much more rapid in its action, but which gives only black tones in the transparency. Shortly afterward, in the course of my experiments, I discovered that the tone or color of the transparency could be varied at will by simply altering or increasing the time of exposure and using a weak or restrained ferrous oxalate developer. This discovery was published at the time, and at the same time I ventured to predict that this or a similar modification of the gelatino-chloride process, applied to paper, would probably prove the quick printing process of the future. That my prediction has already been partially fulfilled is shown by the rapid printing papers already in the market and more or less extensively used. I have brought with me some of the results of my earlier experiments in this direction, which may be interesting.

With regard to the development of gelatino-chloride plates for transparencies, the rule above mentioned holds good. Short exposure and powerful development gives black tones, while full exposure and restrained development gives warm or red tones.

The following formula will give good results with any desired range of color:

STOCK SOLUTION.

No. 1.

Oxalate of potash	2 ounces.
Chloride of ammonium	40 grains.
Bromide of potassium	20 "
Distilled water	16 ounces.

No. 2.

Sulphate of iron	4 drachms.
Citric acid	2 "
Alum	2 "
Distilled water	16 ounces.

The developer is made when required for use by mixing equal parts of the above solution.

To print the transparency, the chloride plate is placed film side next the negative, in an ordinary pressure frame, taking care to adjust the plate exactly in position over that part of the negative which it is desired to reproduce. The manipulations may be safely done by candle light, or weak gaslight, as, although the plates are very sensitive to daylight, they are not very sensitive to ordinary artificial or yellow light.

The time of exposure to diffused daylight, two or three feet from the window of an ordinary room, will vary from two to twenty seconds, according to the power of the light and the density of the negative; full exposure in a dull light usually gives the best results.

With weak or thin negatives, it is better to cover the printing frame during exposure with a piece of opal glass or white tissue paper, giving sufficient exposure to compensate for the loss of light. A convenient method of printing by artificial light consists in burning an inch or so of magnesium ribbon at a distance of twelve inches from the printing frame; several plates in separate frames can be exposed at the same time to lessen the cost, which is, however, very trifling.

To develop the transparency, place the exposed plate film uppermost in a porcelain dish, mix equal parts of the above solutions, adding No. 2 to No. 1, and pour the mixture rapidly and evenly over the plate; rock the dish during the progress of development (which may be examined from time to time by yellow light). When sufficient detail and density is obtained, which will usually be in about two or three minutes, pour off the developer into a measure, and flood the plate with water, and wash well under the tap.

The above developer, with moderate exposure, will give positives of a rich black or purple color; warmer or redder tones may be easily obtained by simply diluting the mixed solutions with an equal quantity of distilled water, or by adding to each ounce three or four drops of a sixty-grain solution of bromide of potassium and proportionally increasing the time of exposure. In practice it will be found a good plan to make up two separate portions of developer, strong and weak, and commence with the latter. Should the plate prove to be underexposed, the developer must be poured off and the more concentrated solution used to bring out the picture and complete development. This method will allow considerable latitude in the time of exposure. Several plates may be developed in the same solution; but the developer gradually loses its energy, and will not keep long after being mixed.

To fix the pictures make up the following fixing solution:

Hyposulphite of soda	1 ounce.
Water	8 ounces.

Pour sufficient of the above, when dissolved, into a separate dish kept for the purpose, and immerse the developed and washed plate for two or three minutes, or until fixed, taking care not to expose the plate to light during the operation; then wash well under the tap, and apply the following clearing solution:

Sulphuric acid	½ ounce.
Saturated solution of alum	20 ounces.

Pour a small quantity of the above repeatedly over the plate for about a minute, or until the slight deposit of oxalate of lime (caused by the washing water) is dissolved away, and the picture becomes bright and clear; as soon as cleared, wash well in repeated changes of water, and allow the film to dry spontaneously. In working this process, great care must be taken that not the slighest trace of hyposulphite of soda comes into contact with the developing solution or with the plate, before or during development. Separate dishes must be used for each solution; the dishes, as well as the hands of the operator, should be frequently washed and kept scrupulously clean during the various manipulations, otherwise the films are liable to become stained and discolored.

When quite dry, the transparencies may be varnished with good clear negative varnish applied with heat in the usual way.

The above method of making lantern slides by contact printing from small negatives will be found all that can be desired. In cases where it is desired to obtain slides for the lantern from larger negatives by printing in the camera, the chloride plates are not found so suitable, owing to their comparative want of sensitiveness to the weaker rays of light which pass through the lens, therefore it becomes desirable to use a more sensitive film. For this purpose it is found that gelatino-bromide plates having the sensitive compound in the film in an extremely fine state of division will, with suitable development, give excellent results, and be sufficiently rapid for all purposes; in fact, plates of any rapidity may be used, provided the development be modified to suit the degree of sensitiveness in the film. Care must also be taken to avoid fogging the plates by actinic light previous to exposure, or during development; at least some portion of the highest lights in the picture should be represented by absolutely clear glass, without a trace of fog or deposit of any kind, which would detract from the brilliancy of the image. These plates are also suitable for contact printing by gaslight, and with a plate of moderate rapidity, about eight or ten seconds' exposure to the light of a good "fish tail" burner, at a distance of about twelve inches from the flame, will be found sufficient for negatives of ordinary printing density; thinner negatives should be exposed less time or at a greater distance from the light. Exposure may also be made by diffused daylight, in the dull light of an ordinary room; it is, however, far more difficult to judge the correct time, therefore it is preferable to use artificial light.

It is important that as nearly as possible correct exposure be given, according to the density of the negative and the power of the light; underexposed plates when developed appear hard, with black shadows and want of detail in the half tones, while very much overexposed pictures are usually thin and flat, without sufficient contrast.

For printing lantern slides in the camera, it will be found a convenient plan to diffuse the light which passes through the negative by means of a sheet of white tissue paper stretched on a frame, and arranged about two inches from the back of the negative; a shallow tray or box without lid, with an open space for the negative cut in the bottom of the tray, and the other side of the tray covered with tissue paper, will answer admirably for the purpose. The space between the camera and the negative should be covered so as to exclude the light. This may be done by means of a sleeve or tube of dark cloth or velvet attached to the tray, and tied at the other end around the lens of the camera. The exposure may be made at a window by diffused daylight, or by burning a few inches of magnesium ribbon a few inches from the tissue paper screen. The flame should be moved about during combustion to insure equal distribution of the light through all parts of the negative.

The plates may be developed with any of the usual formulæ for ferrous oxalate or alkaline pyro, taking care to use sufficient bromide as a restrainer; the iron developer already given for chloride plates answers well.

Ordinary tea saucers form capital dishes for washing lantern slide plates, the transparencies being placed film side downward, so that the plate is supported by the corners a little above the bottom of the vessel. An hour's washing in this manner with several changes water will be found amply sufficient to remove the hyposulphite from the film.

How the New Mexicans Capture Ants.

An automatic combination self-adjusting ant trap and intoxicating machine has been in use for years in New Mexico and Arizona, which is worthy of careful civilized attention. The chief blessing of that arid section is held to be *mescal*, a fiery liquor distilled from a species of cactus, and the principal curse is an immense black ant that considers himself proprietor of any premises to which his nest may belong. It is said that the natives could not live without either the *mescal* or the ants, for while it is only *mescal* that can make a Mexican's life endurable with the ants, it is only the ants that can wake a Mexican from the profound coma into which the *mescal* plunges him.

The ancient Mexican method of trying to get rid of an ant's nest was to fill up the main hatch with fine gunpowder and touch it off, keep a fire boiling over it night and day for a week, or drown it out with boiling lye. The only result was that the ants would stay down cellar until the trouble was over, and then cheerfully repair the damage done to their dwelling, and "lay for" the Mexican in the silent watches of the night with a vigor and alacrity that were truly awful.

One day a desperate Mexican poured a quart of *mescal* down his throat and buried the bottle in the center of the principal ant's nest in his yard, with the intention of filling it with gunpowder and blowing both himself and his enemies out of the Territory. Having buried the bottle to its neck, he went to the trader's to get the powder. When he returned, he found that the bottle was filled with ants, whom curiosity had prompted to drop in, and who, unable to climb out, were indulging in a rough and tumble free fight that did the Mexican's heart no end of good. Another bottle was quickly procured and filled, and by sunset the Mexican found himsel proprietor of seven quarts of ants in various stages of mutilation and wrath. To shake these into a bonfire was easy, and thus in a day the colony was broken up forever.

The writer has seen two pounds of rifle powder rammed into an ant's nest and prove ineffective in its destruction, while by the bottle system the work was thoroughly accomplished in less than a week by the capture of the last ant in the community.

Importation of Carriages by Americans.

Mr. Phelps, the new Minister to England, declared in a recent speech before one of the London guilds that "America makes better carriages than England, and makes them cheaper." The London correspondent of the Liverpool *Mercury* disputes this statement, and says that "while America makes lighter and stronger conveyances than England, the landaus and broughams of New York are most of them built in England; and that, in spite of a heavy duty, carriages are bought in London and shipped to New York."

In response to the last statement, *Coach, Harness and Saddlery*, of this city, has published the following energetic rejoinder. It says: "It is true, carriages are purchased in London and shipped to the United States, but the statement that 'the landaus and broughams of New York are most of them built in England' is sheer nonsense. The total appraised value of carriages imported into the United States during the year ending November 30, 1885, was a trifle over $70,000, more than one-half of which were from France. The total number of carriages imported is less than one hundred. Of these, judging from the values appended, at least one-quarter were small vehicles. One of the leading houses in the city of New York has sold more broughams since the 1st of July, 1885, than the total imported from Europe in a year. The larger number of imports are by Americans who purchase vehicles when visiting England or France. One fact is notorious: the vehicles imported are, as a rule, plainer than would be accepted from home builders."

"HORSE SENSE" is well illustrated in the way that some of them perform their duties on the top floors of New York warehouses, where other power is not available, in the work of hoisting goods to the different floors. In one case a horse has thus been kept at the top of a high warehouse for eleven years, without having been down to *terra firma* but twice in the whole time. The horses are directed when to pull and when to stop, pulling by the sound of the check rope when shaken from below, to which they invariably give a prompt attention that might well be imitated by many workers in a higher field, but otherwise they are always left to themselves.

ENGINEERING INVENTIONS.

A steam actuated valve has been patented by Mr. John T. Toole, of East Saginaw, Mich. Between the steam chest and the cylinder is an auxiliary steam chest with an auxiliary valve, with other novel features, whereby steam pumps will work with regularity, and will not be left on the dead center at starting or stopping.

MISCELLANEOUS INVENTIONS.

A register for elevators has been patented by Mr. Daniel Segur, of Toledo, O. It is a registering mechanism for measuring the distance traveled by hydraulic elevators in one direction, by which, when the size of the cylinder or piston is known, the consumption of water will be indicated.

A well drilling machine has been patented by Mr. Oscar Rust, of Ithaca, N. Y. This invention relates to machines in which the drill tool is worked on a rope actuated by a cam, and provides a friction gearing to prevent breakage, besides simplifying the construction, and enables the spool or the rope drum to be quickly thrown into or out of gearing.

A tedder has been patented by Mr. John M. Holler, of Albany, N. Y. The construction is such that by operating a lever easily reached from the driver's seat the forward end of the machine can be raised and lowered, and the tedder teeth adjusted to work at any desired distance from the ground, making a strong, convenient, and reliable hay tedder.

A baby carriage has been patented by Mr. George A. Ellis, of Gardner, Mass. The front ends of its side bars are bent upward to form springs for supporting the body at the front end, the side bars being braced by rods in the usual manner, the construction being simple and giving additional spring at the rear end.

A parlor base ball game has been patented by Mr. Jacob S. Aydelott, of Xenia, Ind. The apparatus of the game consists of a board or table having a baseball ground marked thereon, and a number of cards, each bearing one or more of the technical phrases used in baseball playing, the fielding and batting sides playing against each other with the cards.

A baling press has been patented by Mr. George Ertel, of Quincy, Ill. It has certain novel features of construction and combination of parts of the power connections between the sweep and the plunger, by which the power applied to the sweep is made to operate the plunger in the press box most effectively, while the device is simple and inexpensive.

Automatic water works forms the subject of a patent issued to Mr. Mathias A. Laska, of New Orleans, La. It consists of a special combination of pipes, valves, and other pieces, in connection with reservoirs, working on the siphon principle, for raising and delivering water without the use of a motor or other power machinery.

A door latch has been patented by Mr. Theodore C. H. Bayrhoffer, of Rising City, Neb. It is reversible, to suit either right or left hand doors, and its operation is simple, as the spindle does not have to be turned to withdraw the bolt, while the latch is strong and durable, may be easily applied to the door, and is cheaply made.

A wire hoop has been patented by Mr. Jacob C. Durling, of Marine City, Mich. This invention consists in a block grooved longitudinally, and apertured to receive the ends of the wire, bent outwardly and riveted in the block, thus making a fastener, so a strong hoop can in this way be made of wire instead of the ordinary hoop iron.

A chimney cap has been patented by Mr. Thomas Edwards, of Amherst, N. S., Canada. It is composed of two semicircular or arched hoods halved into each other at right angles, and secured to an open base to be fitted to the chimney top, to present direct draught openings through the hoods to the four points of the compass.

An auger has been patented by Mr. Benjamin Forstner, of Salem, Oregon. The peripheral cutting edge is formed on the circumference of a slotted disk, the edge being in two parts, which begin at one of the slots of the disk and terminate at the other slot, the invention being an improvement on a former patented invention of the same inventor.

A saw has has been patented by Mr. George N. Clemson, of Middletown, N. Y. It is made of a strip of steel, with teeth cut upon opposite edges for sawing metal, the blade so formed being heated to a suitable temperature for hardening, and the teeth being then simultaneously hardened while the body of the saw is left soft.

A follower for packing barrels has been patented by Mr. Charles T. Bellamy, of Prompton, Pa. It has penetrating points or locking surfaces at one side and a swinging brace or locking lever at the opposite side, to lock the follower to the inside of the cask, and keep the substance packed submerged in the brine or other preserving liquor.

A towel holder has been patented by Mr. Charles H. Delanoy, Jr., of New York city. It consists of a flanged dram mounted on a shouldered axle, and a coiled spring within the drum, to the outer surface of which is attached a cord carrying a hook or clasp for holding the towel, the device being simple in construction and making an effective holder.

Pliers form the subject of a patent issued to Mr. Charles F. Hill, of Springfield, Wis. They are formed of two crossed levers pivoted at the intersection, each lever having a jaw in its inner edge with a semicircular recess having a semicircular groove, making a tool especially designed for closing open wire rings for holding uprights on fence wires.

A blacking box has been patented by Mr. George Ridgway, of Towanda, Pa. It has an inner rim attached to the bottom, and forming with the box an annular space and compartment, so that when the box is taken in the hand, to use the blacking, the brush will be prevented from coming in contact with the fingers by the outer wall of the box.

A lemon squeezer has been patented by Mr. Jacob J. Sturis, of Memphis, Tenn. Combined with a cup having a perforated bottom is a pivoted lever with a block fitting in the cup, and an inverted cup shaped plate with notches in the rim, held on the bottom of the cup by a screw, so the juice cannot flow out too rapidly at the bottom or squirt out at the top.

A bedstead or cot has been patented by Mr. Henry Williams, of 2 Duke Street, London Bridge, Surrey Co., Eng. This invention covers a novel combination of parts in a bedstead or cot, which shall be comfortable and strong when set up, and which can be readily erected and conveniently taken down and rolled up in a small package.

A clothes line has been patented by Mr. Albert G. P. Dorsey, of Clarksburg, Ind. It is designed to be operated between the laundry room of a house and a post in the yard, so that clothes may be both hung out and taken in without going out of doors, and provides for preventing sagging of the line and gathering of the clothes pins, with various other novel features.

A draught equalizer has been patented by Mr. George C. Flagg, of Columbus, Ill. Combined with a triple tree are double trees pivoted to its under and upper sides, and having their inner ends turned downward and upward over the contiguous ends of the triple tree, to equalize the torsional strain and the draught on the shoulders of the middle horse.

A washing machine has been patented by Mr. Charles F. Decker, of Salt Lake City, Utah Ter. The tub has a series of vertical shafts, with plungers on their lower ends surrounded by open-ended cylinders, springs connecting the cylinders to the shafts, while other springs force the shafts downward, the tub being revolved and the plungers forcing the water through and beating the clothes.

A bobbin winder has been patented by Mr. William Connolly, of South Norwalk, Conn. It is to facilitate the winding of sewing machine bobbins with little attention from the operator, the bobbins being placed on the shaft of the winder and the thread caught in them, when they will be wound, and the rotation of the bobbin and thread spool stopped automatically when the bobbin is filled.

A spindle step for spinning machines has been patented by Mr. William A. Delmage, of Lowell, Mass. It is an annular depression or groove provided in the top of the air-chamber and around the spindle to facilitate oiling in cases where the spindle cannot readily be raised in the step, as in ring spinning frames, the invention being an improvement on a former patented invention of the same inventor.

Chenille for embroidery forms the subject of a patent issued to Mr. Julius Frelloehr, of San Francisco, Cal. It consists of a chenille strand of plush or pile threads, with binding threads twisted together thereon to hold the latter, and a fastening thread wrapped around the pile and binding threads, making a strand which will not untwist, without using gum arabic or other pastes.

A band saw mill has been patented by Messrs. Francis M. Hanks and Horace N. Sibley, of Midway, La. The saw has a longitudinal series of holes, and the wheels on which it is mounted have pins projecting through their peripheral faces to engage the holes, springs affording a yielding movement to the pins, and the saw being adapted to cut timber from either side of the table.

An apparatus for effecting emulsions of fats with milk, etc., has been patented by Mr. Carl August Johansson, of Stockholm, Sweden. It consists of two conical cups mounted on a shaft so that the larger openings face each other and a narrow vent is formed between the edges of the cups, so that the apparatus, being rapidly revolved, will finely divide a liquid fat and intimately mix it with milk.

A combined buttoner and cigar cutter has been patented by Messrs. Louis B. Prahar and Charles S. Shepard, of Brooklyn, N. Y. Combined with the slotted stem of a button hook is a bar hinged in the slot, provided with a cutter, making a device which can be readily used for buttoning shoes or gloves, or for cutting off the ends of cigars, and which can be conveniently carried in the pocket.

A safety wheel for roller skates has been patented by Mr. Rossiter I Towle, of Gunnison, Col. Prongs project downward from the rear end of the skate, with a series of apertures for receiving a pin, with a roller mounted between the prongs on the pin, and a series of apertures for receiving a locking pin for locking the roller in place, and enable the skater to easily maintain his equilibrium.

A barrel leveling and trussing machine has been patented by Mr. Gustav H. W. Simmon, of St. Louis, Mo. It has a stationary and a movable platform, each with diagonal slots, and hoop drivers held in the desired positions by bolts passing through the slots, with movable barrel leveling disks acted on by weights, with other novel features, for leveling and trussing barrels, kegs, etc., at one operation.

A flexible abrasive or polishing disk has been patented by Mr. Joseph W. Byers, of Charleston, Ill. It is especially designed for dressing and finishing rubber plates and artificial dentures, and consists of a circular body of cloth, rubber, leather, or other flexible material, that will keep pliable, having an outside layer of flexible abrading material, all carried on the mandrel of a lathe.

A hame coupling has been patented by Messrs. William A. Smith and John H. Hughes, of Woodlawn, Neb. It consists of a main plate with arched and apertured middle part and grooved side flanges, with adjustable side plates carrying hinged loops to receive the hames, to keep the horse's neck cool and prevent it from being pinched, while it is adjustable for larger or smaller horses.

A lamp burner has been patented by Mr. Joseph A. Coultans, of Brooklyn, N. Y. It has a cylindrical tapered neck, a fountain cap with inverted conical seat, differing slightly in diameter from the neck of the burner, and wedge-shaped projections from a ring placed within the burner, and taking into hook-shaped catches from the fountain cap, forming a tight joint to prevent leakage by capillary attraction or by moving the lamp.

A swing has been patented by Mr. Geo. Bauer, of St. Louis, Mo. Its construction is such that, with one or more persons occupying each seat, when those on one seat exert a downward pressure on the foot board, the swing frame is swung toward the side on which the pressure is exerted, when a like pressure on the other side produces a motion in the inverse direction, so the swing can be readily operated by those occupying it.

A learner's telegraphic instrument has been patented by Emmor Bonsall, of Davenport, Iowa. Combined with a frame having spring contacts connected with circuit wires are devices for pulling a slotted or recessed strip between the spring contacts, thus breaking and closing the circuit, so that a perfect drill of the ear in the Morse characters can be accomplished by the aid of the machine, the characters being sounded so that one can thereby learn them without a teacher.

A rheostat for incandescent electric lights has been patented by Mr. S. Ambrose Hill, of Sunbury, Pa. (George Hill, administrator of S. Ambrose Hill, deceased.) It consists of a series of insulated wires secured to a drum or cylinder, the wires having base parts, and their ends connected by fine insulated wires, one of the wires being connected with a binding post, a contact spring connected with another binding post resting on the base parts of the wires.

A measuring pump has been patented by Mr. Amos B. Simonds, of Youngstown, O. It is more especially designed for measuring oil as drawn from a barrel, the pump bringing the oil into a vessel provided with floating gauge rods which indicate the quantity thus pumped, before it is removed from the vessel by a cock in its bottom, while under this vessel is a drip pan to conduct the drippings back into the pump.

A galvanic battery has been patented by Messrs. Alexander H. and Alfred W. Roovers, of New York city, and Percy G. Williams, of Brooklyn, N. Y. The zinc electrode has a longitudinal perforation, and the packing small side perforations, within and without the battery, while the carbon cup is in one end of the case and a rubber or other non-corrosive stopper in the other end, making an improved portable therapeutic apparatus, not liable to leak, and occupying but little space.

NEW BOOKS AND PUBLICATIONS.

WORKSHOP RECEIPTS. Fourth Series. By C. G. Warnford Lock. New York: E. & F. N. Spon.

The four books now comprising this series represent a good deal more valuable features than are usually comprehended under the name of "receipts." The articles under some of the headings are really as comprehensive as would be found in a text-book on the subject treated of. The matter is to a great extent a compilation, but the work has been done by an intelligent hand, generally well acquainted with the most recent details of workshop practice. The principal subjects treated of in this volume are, Waterproofing, Packing and Storing, Embalming and Preserving, Leather Polishes, Cooling Air and Water, Pumps and Siphons, Desiccating, Distilling, Emulsifying, Evaporating, Filtering, Electrotyping, Stereotyping, Bookbinding, Straw-plaiting, Musical Instruments, Clock and Watch Mending, Photography, etc. This volume also has an index covering subjects treated of in all four volumes of the series, covering an extremely wide variety of workshop practice.

The Page Belting Company, of Concord, N. H., have issued a neat catalogue and price list of their belting and lace leather, with practical rules for the use of belting. It presents many facts worthy of the attention of buyers of belting and those having charge of machinery, and has a simple but very complete cipher code, by which the customers of the company can readily order by telegraph any of the goods mentioned.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Gold Mines

are very uncertain property; for every paying mine a hundred exist that do not pay. But if you write to Hallett & Co., Portland, Maine, you will receive free full particulars about their new business, and learn how some have made over $50 in a single day at it. You can live at home, and earn from $5 to $35 and upward per day. Both sexes; all ages. Capital not required; you are started free. Send along your address, and all will be proved to you.

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Wanted.—A first class scientific draughtsman. Address J. P. H., P. O. Box 773, New York city.

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Inventors having patents of merit for sale, address Chas. Babson, Jr., 24 Congress St., Boston, Mass.

Belshazzar's Warning.

"Tried in the balance and found wanting," is the general verdict rendered against most of the so-called cures for lung troubles. Such a decision has never been given against Dr. R. V. Pierce's "Golden Medical Discovery." On the contrary, it is conceded by thousands who have tried it, to be the only remedy for consumption (scrofula of the lungs) and scrofulous diseases generally. It will not cure when both lungs are most gone, but if taken when the disease is in the first stages it never fails. It is also specific for such scrofulous affections as fever-sores, white swellings, hip-joint disease, and great eating ulcers, and for blood taints generally, from whatever cause arising. By druggists.

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The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Machinery for Light Manufacturing on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Send for Monthly Machinery List
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121 Chambers and 103 Reade Streets, New York.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Curtis Pressure Regulator and Steam Trap. See p. 142.

Grimshaw.—Steam Engine Catechism.—A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

Nystrom's Mechanics.—A pocket book of mechanics and engineering, containing a memorandum of facts and connection of practice and theory, by J. W. Nystrom, C.E., 18th edition, revised and greatly enlarged, *plates*, 12mo, roan tuck. Price, $3.50. For sale by Munn & Co., 361 Broadway, New York city.

Best Automatic Planer Knife Grinders. Pat. Face Plate Chuck Jaws. Am. Twist Drill Co., Meredith, N. H.

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Curtis Pressure Regulator for Steam Heating Apparatus, Waterworks, etc. Curtis Regulator Works, Boston, Mass.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

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Safety Elevators, steam and belt power; quick and smooth. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 158.

Domestic Electricity. Describing all the recent inventions. Illustrated. Price, $3.00. E. & F. N. Spon, New York.

Astronomical Telescopes, from 6" to largest size. Observatory Domes, all sizes. Warner & Swasey, Cleveland, O.

Billings' Patent Screw Plates. Drop Forgings, all kinds. Billings & Spencer Co., Hartford, Conn.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) C. G. desires (1) a formula for gilding sunk and raised letters in stone (marble). A. Apply first a coating of size and then several successive coats of size thickened with finely powdered whiting until a good face is produced. Let each coat become dry, and rub it down with fine glass paper before applying the next. Then go over it evenly and carefully with gold size and apply the gold leaf, burnishing with an agate; several coats of leaf will be required to give a good effect. 2. Is there any gold liquid that can be applied which will give as good an appearance as the above way of gilding, and how is it made? A. There is a gold color stain for marble, consisting of equal parts of zinc sulphate, ammonium chloride, and copper acetate (verdigris), all in fine powder, carefully applied.

(2) H. R. T. writes: I have a 20 horse power engine running a 52 inch, saw direct from driving wheel, which is 60 inches, and runs on 18 inch pulley on saw mandrel; engine runs 170 revolutions per minute. Can I run a countershaft and increase the speed of the saw, and do as much work as I can direct, without losing power? A. You may accomplish more speed with a countershaft, but no more work, unless the engine is in excess of power over the requirement of the saw. This you should observe by increasing the feed to the saw. If, in your judgment, the engine is capable of more power, you may put a smaller pulley, say of 12 inches diameter, on the saw mandrel, and, if necessary, place a light tightening pulley near the saw pulley upon the slack side, to increase the belt lap. We think this preferable to a countershaft and two belts.

(3) J. W. H. writes: If a wheel, say an undershot one, is placed in a stream running from a reservoir, what portion of the water that works it can it be made to pump back into the reservoir from a pool below, say at a depth of 15 feet from the surface of the water in the reservoir? A. From 40 to 50 per cent into its own reservoir.

(4) M. J. asks a cheap preparation to dip wrought iron articles in to prevent rusting (after being milled). A. Use hot soda water to clean from oil, then hot lime water, and dry.

(5) B. T. T. writes: Boat A and boat B are running in the same direction at bullet speed. A man standing on boat A, which is 25 feet behind boat B, shoots at the man on boat B. Can he hit him, or, in other words, will the bullet overtake boat B, when they are all going at bullet speed? A. Yes; substantially the same as if all parties were standing.

(6) M. K.—The gas governor referred to is a good regulator of pressure, and will save gas when the street pressure is higher than required for economical burning. Burners do best at from ½ to ¾ inch water pressure. In most towns and cities the pressure in the service pipes is from 1¼ to 2 inches. The governor regulates this to a uniform standard.

(7) S. Y. C. ask the difference, if any, between so-called chilled shot and regular patent shot. A. All shot are chilled by an air blast, and fall into water to prevent bruising. The patent is in the method of finishing.

(8) T. E. wants to know the ingredients, proportions used, and manner of preparing mucilage for wrapping papers and family use generally? A. For household purposes an article is prepared by mixing 3 ounces gum arabic, 3 ounces distilled vinegar, with 1 ounce white sugar. Instead of the distilled vinegar, 1 part acetic acid and 5 parts water may be substituted.

(9) F. T. asks: What solution is used for tinning cast iron by dipping? A. Cast iron is very difficult to tin. It cannot be tinned by dipping. Can be tinned with a soldering copper, if made clean.

(10) O. A. L. asks: 1. What college near central Illinois could I best study in as a Presbyterian minister? A. Blackburn University, Carlinville, Ill. 2. What is the usual time for a graduate of a common high school to graduate as such minister? A. Probably about four years. You can obtain this information by consulting the catalogue of the institution referred to, which will be sent you on application. 3. What is the salary of such ministers? A. From about $400 upward. Your abilities may be such as to command a larger salary.

(11) W. J. C. asks: 1. What is the difference between crown glass and flint glass? A. The difference is in the composition, crown glass being composed of silica, potash, and lime, while to these ingredients is added about 40 per cent oxide of lead for flint glass. 2. Is there a book published on optics as applied to photography? A. There are many books on photography. We believe none on the optics of photography specially.

(12) E. S. writes: 1. There is a towboat here having an engine 17x17, working high pressure (100 pounds), non-condensing, and there is talk of putting in a surface condenser and independent air and circulating pump. If the change is made, will it make the boiler steam any harder, or require a larger boiler? A. The surface condenser will add about 12 to 15 per cent to the power of your engine. The air and circulating pump may absorb ¼ to ⅓ the gain, so that you will still be a gainer. 2. Would it be practical to compound the cylinders in an engine for a boat of this size? A. We do not think an ordinary propeller engine of that size can be compounded to advantage.

(13) L. M. G. asks how to rig up an anvil in the rear of a store, so that it will make as little noise as possible. A. Set the anvil on a block of lead; or make a patty ledge around the anvil upon the wooden block, ½ inch clear all round, 1 inch high. Raise the anvil clear of the block ½ an inch, by any means available, pour in the lead until it rises above the bottom of the anvil; or set the anvil on a good bed of sand held in a box.

(14) W. D. G. writes: How fast should a sheet iron disk run to cut steel? I have made one 28 inches in diameter and run it 5,000 revolutions per minute, and it will not cut nearly as fast as a thin emery wheel would do it. The disk is made of Russia iron, and run on a small saw arbor, first at about 3,000 revolutions and afterward at 5,000. A. The saw should have teeth, and the steel made red hot to cut fast. If not practicable to heat the steel, better use the emery wheel.

(15) G. B. asks whether the base of a mountain is at the level of the surrounding country or at the sea level. A. The base of a mountain is the plain or valley from which it rises. It has no relation to the sea only when washed by the sea.

(16) W. H. L.—You are right. In our formula for solutions for blue prints on paper, in the SCIENTIFIC AMERICAN of October 31 last, the constituents for the second solution were reversed, and should have read ammonia citrate of iron 140 grains, water 2 ounces. It was a printer's error, which even the most inexperienced photographer ought at once to see.

(17) C. E. F. asks how to mix sulphur for making joints under engine beds. A. Melt the sulphur in an iron ladle in the same manner as with lead; only, cover the ladle while melting with a piece of iron to prevent fire.

(18) F. R. writes: I notice that a condenser of a steam pump is attached to the suction pipe below the valves. Would it not work as well to be attached to discharge pipe above the valves? A. No. It requires a suction to clear the water from the condenser. The force would stop the pump.

(19) R. H. asks: Is the gold and silver plate now in use electro-plate, or is it made by some chemical process science has lately developed? A. The plate is made by electro deposition. See "Galvanoplastic Manipulations," by W. H. Wahl, price $7.50; also, "Electrolysis," by Fontaine, $3.50, which we can mail you on receipt of price.

(20) J. N. O. asks: 1. How is the gilding done on china and glassware? How is the amalgam prepared so as to be painted on with a brush? A. See the "Method of Gilding and Painting on Glass and Porcelain," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 86. 2. How can I make an amalgam of copper? A. Copper amalgam may be formed by immersing a piece of copper foil in a solution of nitrate of mercury. See Watts' Dictionary for this method.

(21) H. D. P. asks how rubber boots can be mended. The patches stuck or glued on are poor affairs. A. Rubber cement is the only means that we can recommend for the purpose of repairing rubber articles. Several recipes for such cements are given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(22) M. D. writes: In the manufacture of koumiss, a certain amount of alcohol is generated by fermentation. How can the alcohol be afterward removed, when its use even in small quantities is objectionable, without impairing its virtue as a food? A. It is not likely that the alcohol can be removed unless a lactic fermentation is allowed to occur, but this would produce a sour mixture, which would be unpalatable. We would suggest that a simple mixture of milk and a suitable carbonated water be used in lieu of the koumiss.

(23) I. W. asks for a fire kindler, something that can be smeared on small pieces of wood or mixed with sawdust. A. The addition of a little sulphur, or impregnating the wood with kerosene or bitumen, would cause it to burn readily when once ignited.

(24) N. G. asks: What will cure scab on sheep, especially what could be done in cold weather, or what would be better in warmer weather? You said, in a recent paper, turpentine is a remedy against various insects; might it not be good for scab? A. Take quicksilver 1 pound, Venice turpentine ½ pound, rub them together until the globules are no longer visible. Then add ½ pint oil of turpentine and 4 pounds of lard. In summer, resin may be substituted for the lard. The germicidal properties of turpentine are not sufficient for it to be used alone.

(25) G. H. B. asks if it would be very dangerous or foolhardy to coast from New York Bay to St. John's River bar in a steamer of 6 or 8 tons, 4½ ft. draught, and trust, for safety in storms, to running into river mouths and creeks, said boat (propeller) to be manned by three plucky, tolerably well experienced persons, but who might want to anchor and sleep a little every night? A. This question, as well as the handwriting in which it comes to us, indicates that the "plucky persons" referred to are boys. In reply we would say that, as much smaller boats have crossed the Atlantic, the thing proposed is entirely feasible, if sufficient care and good seamanship accompany the pluck. A season of the year when good, steady weather is the rule should be chosen, and we trust our boys will also take along with them a pilot familiar with the coast.

(26) A. B. C. asks if it is proper, in building a horizontal engine, about 20 x 24, to balance in the flywheel the weight of the piston, piston rod, crosshead, and connecting rod, or should I balance only one-third of the weight of the connecting rod A. If there is a journal between the flywheel and crank, it only makes matters worse by attempting any balance by the flywheel. You can only balance the crank by making it a disk and balancing the rod on the disk, or as much of the piston as the construction will allow. For low speed engines no balancing is required.

(27) T. N. writes: If a bell is rung, say by electricity, in a town or city in which there are no inhabitants within hearing distance, would there be any sound? A. Webster defines sound as the *perceived* object occasioned by the impulse or vibration of a material substance affecting the ear; *a sensation or perception of the mind received through the ear.* But there is a secondary meaning in which the occasion is sometimes called sound, in which sense sounds are spoken of as audible or inaudible.

(28) S. A. L.—The freezing of an exposed whistle pipe in very cold weather is reasonable if it is so arranged that the steam does not readily circulate within the pipe. A horizontal pipe at the lower end of the whistle pipe might partially close communication, by holding the water of condensation; then the vapor in the upper part of the pipe would begin to freeze to the surface until the pipe is closed.

(29) N. P. M.—Imitation water marks may be made in paper by pressure upon a marked plate in which the water mark is raised. They cannot be as permanent as the real mark, because in the real mark the paper is thin under the mark.—All systems of mnemonics require a good memory to start with. We have found nothing as yet beneficial in their practical operation. Any system of mnemonics, as applied to figures, is absolutely useless and mind entangling. Let your figures be written; keep algebraical symbols for their legitimate use, and the mind clear for relational conception.

(30) H. C. asks if there is at present any practical plan for heating house furnaces by crude coal oil. A. Experiments and trials have been made in this line, but so far the odor has been a most objectionable feature, while the management and watchfulness required is more than an offset to any supposed economy.

(31) J. J. F.—The U. S. Government has *not* offered a reward for the discovery of perpetual motion.

(32) J. E. S.—If a fan blows across a boat against a sail inclined to the axis of the boat, a small effect might be expected. If the fan blows forward against the sail, the effect will be much like the man that tried to lift himself in a basket. An auger will not lift water as stated. Propeller pumps for small heights are in common use.

(33) C. H. P. asks: 1. Is a compositor supposed to shoulder the blame for mistakes which appear in a newspaper, or is it the proofreader? A. It is the proofreader's duty to mark all errors plainly on the margin of the proof, and he is to this extent responsible for the final correctness of the printed matter; should the compositor fail to properly make the corrections marked, and the proof is not revised, then the blame for any errors rests with the compositor. 2. Which of the following is written correctly: "Side- and foot-sticks," or "Side and foot-sticks," the question being, Should the hyphen be placed after the word "side"? A. The first quotation is undoubtedly correct, although such use of the hyphen has always seemed to us rather an affectation of purism. In the second quotation, there should be no hyphen at all, as the noun there belongs equally to two adjectives, although it would form a compound word with either one as ordinarily used.

(34) An Inquirer will find many valuable papers on tempering steel mentioned in our SUPPLEMENT Catalogue, notably in Nos. 95, 103, and 105. The steel manufacture is also treated of in many numbers. One of the best recent works on different processes is W. H. Greenwood's "Steel and Iron," which we can mail for $2.00.

(35) F. G. B. asks what is a good polish to put on rubber boots that are nearly new, but no shine on them? A. There is no polish in the market for this.

(36) A. H. D. writes: Is there any particular quality of sheet rubber suitable to tie over top of dropping tube, the tube acting as a stopper to the bottle in which I keep nitric acid, C. P.? The rubber is continually exposed to the fumes from the acid from below, and becomes worthless in a few days. On similar bottles containing hydrochloric, sulphuric, and acetic acid, C. P., I have had the same rubber for over a year, and all are in good condition. A. A thin coat of paraffine on the exposed side would probably prevent the fumes from attacking the rubber.

(37) J. R. desires a formula for furniture polish, having previously bought from a peddler a receipt for which $10 was paid, but which proved unsatisfactory. A. Try the following polish instead. Melt three or four pieces sandarac, each of the size of a walnut, add one pint of boiled oil, and boil together for one hour. While cooling add one drachm of Venice turpentine, and if too thick a little oil of turpentine too. Apply this all over the furniture, and after some hours, rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish, and any stain or scratch may be again covered, which cannot be done with French polish. See also the recipe given on page 198 of SCIENTIFIC AMERICAN for March 28, 1885.

(38) J. F.—The material of which you send a specimen is undoubtedly valuable for the making of fire brick and crucibles; but as similar clay can be purchased at $1.65 a ton at Perth Amboy, N. J., you could not compete with the New York market. If it can be disposed of locally, then it is of value to you, otherwise not.

(39) T. H. asks what will prevent blood from clotting or curdling? A. An aqueous solution of neutral salts, such as sodium sulphate or sodium chloride.

(40) H. C. D. asks how to prepare paper that will disintegrate or become soluble in water more readily than if it were not so prepared? A. By omitting the sizing during the process of manufacture, you will obtain a product that will be more readily disintegrated than the ordinary manufactured article.

(41) C. W. S. writes: 1. I have a lot of unbleached gum dextrine which I have tried to make up. I have been partly successful, that is, I make the solution all right, but it is too dark. Would you inform me how I can make it look white? A. By filtering the solution through a layer of charcoal, the amount of coloring matter will be greatly reduced. 2. If bleached dextrine is as good as the unbleached, if so, what proportion is used, that is, what quantity is used to a given quantity of water? A. The unbleached dextrine contains more gummy material than the bleached. The amount of water to be used depends upon the consistency of paste desired, and it varies in different uses.

(42) H. R. B. desires a description of the cheapest and quickest process of making oxygen gas and condensing it into a liquid form. A. See "How to make Oxygen," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 313. Its condensation into liquid form requires very expensive apparatus, and liquefied oxygen has no commercial uses. See the "Liquefaction of Oxygen and Hydrogen," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 128.

(43) D. B. H. asks: 1. I am building a steam engine, 2½x4 cylinder; what size fine, boiler, supply and exhaust pipes will be required to develop ½ horse power? A. ¾ inch steam pipe, ½ inch exhaust, 8 square feet heating surface in boiler. 2. How is soft solder made to use without acid or resin? A. Add a little bismuth to common solder.

(44) C. W. asks how etching on silver is done. Is it possible to do the same on copper? A. Coat the metal with wax and bite in the design with dilute nitric acid, for both silver and copper.

(45) J. H. K. asks the name of a cheap metal or substance that will expand most at a temperature of from 50° to 200°, and that will be less injured by repeated heating. A. After mercury, try zinc.

(46) H. P. asks (1) further particulars about the uses to which spirit of turpentine can be put for medical purposes. A. The application consists in rubbing it upon the parts afflicted. The quantity depends upon the nature of the complaint. 2. How can I obtain or make the feathers which act as springs under the smaller teeth of the combs of musical boxes? A. An ordinary feather is used, properly clipped, placed between the teeth of the comb, then glued and finally trimmed. The operation is exceedingly simple, but a little experience is necessary for satisfactory results.

(47) C. W. B. asks: 1. Is there any varnish to place on the inside of flower pots to prevent the moisture from coming through without applying heat? A. Use melted paraffine or a shellac varnish. 2. What would be the best varnish to apply on the out side of the pots over water colors? I want a varnish that is brilliant, will wash, and not blister in the sun. A. We would recommend you to use French varnish. A white shellac varnish or a colorless lacquer can also be employed.

(48) M. W. K. asks: 1. Is dust which accumulates in coal mines where hydrogen largely predominates in the coal explosive? A. It is; see "Explosions from Combustible Dust," SCIENTIFIC AMERICAN SUPPLEMENT, No. 166. 2. Rule for computing horse power of engine, the pressure and number of revolutions being known. A. See many former answers.

(49) M. C. A. writes: I have before me the following recipe for making artificial dextrine: 2 parts nitric acid to 300 parts of water, and mixing this liquid with 1,000 parts of dry starch. This mixture is then subjected to heat, or it may be produced by heating starch with diastase. What is diastase? A. It is a peculiar azotized substance contained in malt, which effects the conversion of starch, first into dextrine, then into grape sugar. 2. What proportions (in weight or measure) of the ingredients named above would be proper to use in making say 30 gallons or 240 pounds of dextrine? A. Dissolve 6 ounces nitric acid in 8 gallons of water, and mix with 200 pounds dry starch.

(50) C. F. D. asks: Do all animal oils when used in a steam cylinder with surface condenser form a chemical action injurious to the boiler? What chemical action is formed? A. It is not a chemical action that is feared. The oil gathers the dirt and loose scale in the boiler into a cake or cakes, which come in contact with the fire sheets and burn fast, causing the iron to become red hot and bulge. There is now no doubt of this being a fruitful cause of many explosions.

(51) W. B. B. asks the process and ingredients used in tinning iron or steel on bits, common spoons, etc. Also how to prevent dross from forming on articles immersed. A. The process is the same as in galvanizing with zinc. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 176, 92. To prevent dross, draw the work out of the tin through a clear surface.

(52) H. W. L.—All steam launches or boats of 5 tons and over must be registered by the nearest U. S. Inspector. The fee is $5.00.

(53) H. N. B. writes: 1. I have a nickel plated telegraph sounder, and it seems as if dust had settled down on it, and the dampness in the air made it adhere, till now it don't want to come off. A. The nickel plating is an electrical deposit, and is porous. The oxidation of the metal beneath shows through the pores. When nickel plating is done on iron and not burnished, the iron will rust and show through. You may be able to clean it fairly bright with chalk and water, rotten stone, and oil or rouge. Apply with a soft leather buff. 2. What is a fox wedge bolt? A. A fox wedge bolt is one in which the inner end of the bolt is split to receive a thin taper wedge, which tightens as the bolt is driven home.

(54) H. B.—There are a few locomotives in the United States that can haul one or two passenger cars at 80 miles an hour on a short spurt, but 60 miles an hour is very high speed for straight runs, and out of the question for a continous trip of a hundred miles or over.

(55) T. L. R. asks for a flux to use in aluminum. A. Clean the surfaces well, and use paraffine, stearine, or balsam copaiba.

(56) D. S. asks for a description of the king snake, or house snake, and the superstitious reason why the Germans and Swedes keep them in their houses. A. The snake you refer to is probably the one generally called the "milk snake" in this country. It is described on page 38 of vol. iii. of the Natural History of New York. Its food consists principally of mice, insects, and other house vermin, and hence the probable reason of its being called "house snake." It is not poisonous, and therefore its presence around the dwelling would be quite desirable without any superstitious reason.

(57) P. C.—To soften the surface of steel for engaving, put the piece in a wrought iron box with clean iron filings, covering the surface to be engraved; fill up the box with clean white sand or ashes to keep out the air, and heat red hot for two to three hours, allowing to cool slowly. For hardening files, rub a little hard soap across the teeth to keep from scaling. Heat to a cherry red, and dip endwise in salt water. Then dip in hot fresh water to remove any salt on the teeth, dry over the fire, and slightly wet with linseed oil on a rag. To recover floating gold from the surface of water, gather in a fine muslin net or on a filter of blotting paper.

(58) R. W. B. asks: 1. Is it best to coat new leather belts with castor oil or any other oil? A. New belts should have enough dressing in them to last several months, unless they are getting very hard treatment. 2. The weight a beam would support, and the formula for finding the weight; length of beam 47 feet between the walls; size of beam 14 inches deep, 12 inches thick, with a post in center, and a corbel 8 feet long on the post under the beam. A. A safe load at the center of each span, with a deflection of one-thirtieth of an inch to a foot, is 5,724 pounds for oak, varying a little for different kinds of wood. For distributed load, 60 per cent more. Formula is as follows:

$$\text{Safe load} = \frac{\text{Breadth} \times \text{cube of depth} \times E}{\text{Square of the length}}$$

E is coefficient for a deflection one-thirtieth inch per foot. For yellow pine, E=137; for white oak, E=95. For distributed load add 60 per cent to answer as by above formula.

(59) J. F.—As we have before answered in this column, a boat of considerable draught will float down stream faster than the surface current, because the middle of the current has been found to be moving faster than top, bottom, or sides. Friction of bottom and sides is one assigned cause, and unequal pressure due to depth is another; probably both together cover the whole phenomena. Ice boats in certain positions sail faster than the wind; see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54 and 61, for a graphic description.

(60) K. W. G. asks: What liquid or combination of liquids is the most sensitive to heat and cold, or which will expand the most when subjected to heat? A. Use alcohol, and color it by adding a little aniline if it is desired to use as a thermometer.

(61) J. L. G. asks the best method for preserving split or sawed oak-shingles, when used for roofing? If solution is to be used, the simplest means of using it, with a view to economy. A. The dipping of the shingles in preserving fluids is the simplest plan to adopt. Various fluids are used, and we would refer you to the recent report on the "Preservation of Timber," published in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 512, 513, 514, and 517, as giving the latest and best information on the subject.

(62) M. A. writes: Where sulphur is used as a bleaching medium, what will remove its smell and taste? A. The bleaching is done entirely by burning sulphur, and allowing the fumes to go up through the evaporator. Only a small quantity of sulphur is used, and by care any contaminating taste or odor is prevented. No other means are taken.

(63) G. L. asks: What kind of white paint to use for bird cages. A. White zinc ground in oil.

(64) J. G. writes: I have a quantity of cider which is through fermentation. I wish to bottle it, but it is not clear. Is there anything I can put in it to clarify it? A. To clear impure cider generally, take 2 quarts of ground horseradish and 1 pound of thick gray filtering paper to the barrel, and either shake or stir until the paper has separated into small shreds, and let it stand for twenty-four hours, when the cider may be drawn off by means of a siphon or a stop cock.

(65) J. S. desires some information of the new method of constructing artificial dentures that will hold firmly in the mouth without a plate at the palate. A. By a patented invention consisting of a thin metallic form, upon which may be made an upper or lower denture of any kind, size, or shape. The surface of the form has minute papilliform prominences, which, by displacement of mucus at the points of gum contact, effect surface cohesion as if the denture were glued to the gums, yet cause no irritation, and leave no marked indentations. By this device strong cohesion may be had with a narrow plate, and thus the sense of taste be left unimpaired. For vulcanite work proceed as usual until the flask is parted and rubber packed in the tooth part. Then cut a form to size and shape. Coat the cast with rubber cement.

(66) J. H. asks how to make safety matches. A. Dip the splints in a paste composed of chlorate of potash 6 parts, sulphate of antimony 2 to 3, glue, weighed dry, 1. The paste for the rubbing surface is amorphous phosphorus 10 parts, oxide of manganese or sulphide of antimony 8, glue 3 to 6, weighed dry. The ingredients must be thoroughly mixed, and care must be taken not to mix the chlorate of potash in the dry state with the other materials; it should be mixed first with glue dissolved in warm water. The paste for the rubbing surface may be spread with a brush or spatula on the side of the box. 2. How to make rye whisky? A. To 40 gallons proof spirit add 2 gallons peach flavoring, 1 pint white vinegar, and 12 drops oil of cognac in 95 per cent alcohol. Color with caramel.

(67) W. N. McA. writes: I have a steam launch 32 feet long, 6 feet 3 inches wide, and 30 inches draught of water. I have a 5 by 6 engine of first class make, and an upright boiler 30 by 50 inches. I am using 24 inch 2 flange wheel, made by the New York Safety Steam Power Company. I can make 250 revolutions per minute with 30 pounds of steam. This is of course no pressure for a boiler of that size, but with the wheel I have it is all the pressure I need for 250 revolutions, which I suppose is as high speed as is prudent. The hull is of white cedar and a most excellent model for speed, having been built for use in the navy to be pulled with oars. At 250 revolutions I make about 7 miles an hour. 1. Is it prudent to turn my 24 inch wheel over 250 revolutions, or had I better get a larger wheel, and one with more flanges, and would a 3 flange be better than a 2 or 4, and what pitch should I use in either case? A. You may increase your speed slightly by increasing the speed of the wheel to 300, but you will do better by using a 3 flange wheel of 26 or 28 inches diameter, with a pitch of 3 times the diameter, at the speed named. As you do not give the pitch of your wheel, we cannot decide as to its economy, only that a 3 blade of the same size would do better service. We do not recommend 4 flanges on wheel. 2. I am using salt water part of the time; can I use anything to prevent its injury to the boiler, and is it better to blow out while not in use, or had I better leave water in boiler? A. Leave the salt water in boiler, with as low salinometer indication as possible. When you lie up, blow out and pump up, so as to leave the water as fresh as possible while steam is on. This discharges the air from the water and lessens oxidation. 3. What is best application for outside of boiler to prevent rust? A. Rub the outside of the boiler often with oily waste. In a short time it will have an oil coat baked on, or paint with linseed oil and blacklead. 4. I wish to make hull 18 inches wider; can I "sponsel" it without danger of dry rot, and would you advise that method of getting more beam? A. Would not recommend you to widen or sponsel hull; you cannot better the lines, and may make a very clumsy, slow boat. 5. Which would give greater speed, a wheel of extra high pitch or one of a lighter pitch, provided both were turned same number of revolutions? A. There is a medium pitch, best suited to the ordinary form of launches. A high pitch is suitable for very slim, light boats designed for high speed only. A low pitch is better for boats of burden having full lines. If the size and pitch of wheel were conformable to the practical requirement for midship section and displacement in both cases, the high pitch wheel will give the best speed.

(68) O. W. asks the distance traveled by a column of mercury weighing one pound, contained in a tube one inch in diameter, between 0° (zero) and 90° Fah. A. By expansion a column 1 inch in length at zero becomes 1·008 inches, at 90° Fah.

(69) "Several Students."—In the table of saturated steam on page 708 of Haswell, you will find 14·7 as the atmospheric pressure corresponding with 212° temperature. To this add 15·3, the pressure above the atmosphere, giving you 30 pounds absolute pressure, opposite to which you will find in the table 250·4°, the next figure in the equation, which is the temperature at 15·3 pounds pressure by gauge. 100° means the temperature of feed. We think this will set you right in your problem. We have no information of the action of molasses on boiler scale, any further than the possible chemical interchange of elements as between the vegetable acid of the molasses and the carbonates in the scale. If this is true, the lime will be disengaged as a powdered hydrate. Any other vegetable acid would be an equivalent.

(70) F. A. writes: With an alloy of tin and aluminum for the purpose of soldering aluminum, what flux should be used? One that will prevent oxidation of the aluminum. A. With soft aluminum solders, alloy of tin and bismuth, to be used with a soldering iron, or at a heat of from 300° to 400° Fah., use paraffine, stearine, Canada balsam, or vaseline. For the blowpipe solders of the alloys of silver, aluminum, and tin, use common salt in the same manner as jewelers use borax rubbed up on a slate.

(71) H. G. V. writes: I am running an engine 10x20 inches, 80 revolutions per minute, 75 pounds steam pressure. How much more steam will the engine require to run 160 revolutions per minute and do the same work? A. For increased friction and waste in clearance, probably 25 per cent.

(72) A. E. asks information as to the prospects of a machinist getting work in South America. A. There has lately been started a machine shop for repairing of river and ocean steamers at Para, Brazil; otherwise, Chili is the only State in South America that appreciates mechanics. Write to the Chilian minister at Washington.

(73) G. C. wants to know whether there is more weight on a brick at the bottom of a wall than there is on one half way up? A. Yes; every brick lends its weight to the one below it.

(74) T. H. B. writes: I want to raise stumps straight out of the ground by hitching a span of mules to end of rope passing over pulleys. How many and what size pulleys are needed to raise an oak stump 15 inches in diameter, and what size rope? A. Rope 1 inch diameter in a pair of 4 and 5 pulley blocks.

(75) W. L. C. asks: Will a wheel of 3 feet in diameter traverse an inclined plane in less time than one 1 foot in diameter? A. There should be no difference, except as from the friction of air or unequal density and surface exposed. The law of falling bodies covers this case.

(76) F. C. D. writes: I have a boiler two feet in diameter, four feet six inches high, with 30 1¼ inch tubes, and carrying about 80 pounds of steam; keep fire night and day, and use soft water well filtered. How often ought it to be blown off, and is blowing off sufficient to clean it, as it has no hand hole? I blow it a little every two days, and allow it to cool off and blow it every two weeks. A. The boiler should have two hand holes, near bottom; you do right to blow off often. Drawing the water off when the boiler is cold does not clear out the sediment. Better draw out the fire entirely when steam is up, and then blow out all the water as soon as possible. This tends to stir up the sediment and carry it out.

(77) G. A. M.—For brass bath: Dissolve together, in 2 gallons of water, 8 ounces sulphate of copper and 8 to 10 ounces of sulphate of zinc, to which add 30 ounces carbonate of soda and 15 ounces bisulphite of soda in solution of water. Stir with a glass rod and add cyanide of potassium until the liquor is clear. Settle and decant. Then add an excess of cyanide, 1 ounce, to improve conductibility of bath. For copper coating on embossed cards for matrix: Saturate the card with paraffine or beeswax, and cover the surface with blacklead, using a fine brush.

(78) E.—There are patented anti-friction boxes which are claimed to run dry at very high speeds. They are liable to become clogged with dust and abraded metal, when they lose their anti-friction qualities. Better use hard metal boxes with good oil, which is well tried and reliable.

(79) T. McM. asks: What is the largest engine in the world, for pumping purposes, and its capacity? A. Probably the one at the Lehigh zinc works, Friedensville, Pa. Its cylinder is 110¼ inches in diameter, with 10 foot stroke. It has raised 19,000 gallons of water a minute from a depth of 350 feet.

(80) J. W. H.—The best form of chimney is round, and about 20 times the diameter in height for large chimneys, and from 30 to 40 times the diameter for small chimneys. Chimneys should be adapted in size and height to correspond with the volume of heated products of combustion. There is a little work by Armstrong that will give you the figures, "Chimneys for Furnaces, Fireplaces, and Steam Boilers," 50 cents, which we can furnish.

(81) D. H. W.—We have answered similar questions many times. All parts of the periphery of a wagon wheel move with the same velocity around the axle. The top moves over the ground twice as fast as the axle; the bottom does not move. You may make it look rational by close inspection with both eyes and mind.

(82) W. D. P. writes: Given a locomotive traveling, does her piston head move backward as well as forward? A. Only in relation to the locomotive and its parts. Never goes backward in relation to the track, except when the wheels slip.

(83) O. B. desires some simple way to change the voice temporarily at a mask party. A. We know of no means other than practice. Sometimes removal of teeth or keeping something in the mouth will effect a slight change.

(84) G. S. B.—The pressure of gravity is the supposed cause of the condensation of the elements of planetary matter. In this gradual process the latent heat of the original gaseous and liquid matters is supposed to be developed and gradually radiated away into space. In mechanics, compression develops latent heat into sensible heat. This may be due to both decrease of bulk and molecular change.

(85) S. R. W. desires a receipt for dandruff on the head. A. Use a lotion consisting of two drachms borax dissolved in a pint of camphor water. Use once or twice a week. A solution of two drachms salts of tartar dissolved in a pint of tepid water is likewise recommended.

(86) W. B. J. asks how to make a canvas strop such as used by the barbers. A. Take levigated oxide of tin, prepared putty powder, 1 ounce, powdered oxalic acid ¼ ounce, powdered gum 20 grains; make into a stiff paste with water, and evenly and thinly spread it over the strop. Another method consists of mixing fine emery intimately with fat and wax until the proper consistence is obtained in the parts, and then rub it well into the rubber strap.

(87) W. S. asks the best means to dissolve gum copal and amber to a varnish. And is there any vermilion made that is permanent in color? A. Fuse the desired proportions of the two gums until perfectly fluid, then pour in hot oil; let it boil until it will string very strong, and in about 15 minutes add turpentine. The best vermilion is the quicksilver vermilion, which can be procured from any dealer in dry colors.

(88) J. D. McC. asks if there is anything which will prevent a strong solution of potash alum from crystallizing. A. Dilute by the addition of water.

(89) L. M. K. writes: I made a pickle or brine in which I placed a quantity of well selected butter of splendid flavor, and covered the same in earthen vessels, leaving the brine at least 2 inches over all the butter. The brine I made as follows: Of clean water, Ashton salt, and a small quantity of saltpeter and white sugar; and on taking out the butter, it has a noxious, bitter taste. Will you be so kind as to tell me the cause, also the preventive? A. The bitter taste is due to the addition of saltpeter and sugar, which were not necessary. They can probably be washed out by the process described in answer to query 35, in SCIENTIFIC AMERICAN for September 12, 1885.

(90) L. W.—You may save from 5 to 10 per cent of the fuel in your heating arrangements by thoroughly protecting boiler and pipes with felt. Your self-feeder having taper sides allows the coal to wedge and form an arch. A straight magazine is better. A damper in the stove pipe is proper and safe if it has a hole in it, or is cut away on the outer edge so as not to shut tight and discharge gas into the house. The check door is also in common use, with automatic regulator, and is considered good.

(91) W. E. D.—Milk weighs so very little more than water that it requires a careful measurement to judge it by weighing a quart. It seldom weighs as much as 35-1000 more than water.

(92) C. F. S. writes: I have two Reis telephones, but can't make them work. A. To make the Reis telephone operate successfully, you will need a heavy battery and a very careful adjustment. By substituting the point or block of platinum for the carbon, you will be able to succeed better with your telephone.

(93) J. A. G. writes: 1. Is it true that moist air is lighter than dry air at all temperatures? A. Moist air is always heavier than dry air at the same temperature. 2. Is not moist air that is cooled to the dew point heavier than unsaturated air at the same temperature? A. Yes.

(94) T. F. T. asks: In improvements in electro magnets, what is the object of having hollow tube? Why is there more power than a solid core? A. The principal object in making electro magnets hollow is to avoid the Foucault currents. We doubt if a magnet with a hollow core has more power than a properly constructed magnet with a solid core.

(95) O. W. asks: Will you please inform me how to make a cheap electric battery? I have three glass jars about seven inches high and the same number of inches in width. A. Consult SUPPLEMENT, 157, 158, and 159, for information on the construction of batteries.

(96) H. E. H. asks: 1. Can a spring motor like those described in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 142, 146, 147, 148, and 150, be made to propel a small boat (a Barnegat sneak boat, about 10 or 12 feet long)? A. Probably a spring motor could be arranged to drive a small boat for a short distance; but we think it would be easier to row the boat than to wind the motor. 2. Can you give me the address of any one that could make the motor for me? We do not know of any one regularly engaged in the manufacture of spring motors. 3. Do you think the motor advertised by the Electro Dynamic Co., of Philadelphia, in SCIENTIFIC AMERICAN EXPORT EDITION for September, 1885, page 206, would do? I want to use this boat for fishing and hunting. A. It is hardly large enough for your purpose, but possibly the same company can provide you with an electric motor which would answer.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

F. H.—The specimen sent has the appearance of being a piece of clay iron ore, whose surface has been worn by glacial action in past geological ages.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 23, 1886,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Abrasive or polishing disk, flexible, J. W. Byers.. 336,685
Amalgamating pans, attachment for, J. A. Bidwell.. 336,692
Ammeter, J. A. Barrett.. 336,698
Auger, B. Forstner.. 336,709
Axle box, car, H. K. Austin.. 336,685
Axle box, car, K. S. Austin.. 336,831
Axle nut, M. S. Freeman.. 336,710
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Book for binding, machine for gathering the folded sheets or signatures of a, F. Wood.. 336,878
Boot, felt, S. G. Alexander.. 336,542
Boot or shoe, W. H. Wetmore.. 336,775
Boot or shoe soles and uppers, uniting, E. C. Bonnett.. 336,548
Bottle stopper, A. E. Fraser.. 336,848
Box. See Axle box. Blacking box.
Box loop, F. A. Neider.. 336,735
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Brick hack, portable, Walker & Miner (r).. 10,694
Bricks, implement for edging or turning, A. G. Osman.. 336,830
Bricks, picking up and carrying, A. G. Osman.. 336,737
Bridge gate, U. Dood.. 336,843
Brush, rotary, R. J. Curtin.. 336,842
Bung, W. Taylor.. 336,705
Bungs, machine for making compressed, E. D. Mackintosh.. 336,652
Burial caskets, furniture, etc., plastic compound to be used in the manufacture of, T. Law.. 336,732
Bustle, W. F. Russell.. 336,870
Button fastener packing case, F. H. Richards.. 336,589
Button setting instrument, Bairstow & Keavy.. 336,832
Button setting instrument, T. E. Keavy.. 336,859
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Cake, jumble, and snap machine, M. De Tamble (r).. 10,691
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Candy manufacturing machine, G. S. Collum.. 336,839
Car coupling, N. H. Broun.. 336,791
Car coupling, C. Halpin.. 336,806
Car coupling, D. O'Rourke.. 336,736
Car coupling, Storms & Arnold.. 336,871
Car coupling, J. A. Turley.. 336,875
Car coupling, J. T. Wilson.. 336,778
Car, stock, J. W. Street.. 336,873
Car, stock, J. H. Wickes.. 336,776
Cars, device for controlling the motive power and brakes of power driven, E. Samuel.. 336,751
Cars, device for moving, E. P. Weaver.. 336,680
Cars with gas, apparatus for heating railway, J. Pintsch.. 336,565

Carding machine, W. H. Rankin 336,567
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Cordage, composition for treating, Horner & Hyde 336,718
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Corset, A. H. Traver 336,768
Corset stiffener, H. M. Van Etten 336,606
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Cotton scraper attachment, T. Felps 336,803
Countersinking tool, F. Happersberger 336,566
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Curtain fixture, J. Gamble 336,851
Curtain fixture, L. Weber 336,610
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Electric machine, dynamo, J. M. A. Gerard-Lescuyer 336,636
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Fruit jar, E. A. De Steiger 336,800
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Gauge. See Glass cutting gauge. Machine table gauge.
Gauge, H. Plante 336,742
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Glass cutting gauge, E. O. Boyle 336,854
Glassware, shaping, D. C. Ripley 336,606
Glycerine from fatty substances, extracting, J. H. Clinton 336,795
Governor, steam engine, N. F. Burnham 336,836
Governor, steam engine, J. Richards 336,747
Grab hook for chains, M. Barr 336,687
Grader, road, F. M. Pennock 336,821
Grain adjusting device, H. Curtis 336,553
Grain elevator, M. F. Seeley 336,755
Grain separators, fan for, J. Hawk 336,567
Grass hooks, manufacture of, G. Nolin 336,819
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Gun, breech-loading, H. M. Quackenbush 336,586
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Harness loop and bar, J. W. Ropp 336,594
Harrow and pulverizer, combined, R. Cleary 336,794
Harvester cutting apparatus, D. Shields 336,670
Hay stacker, Warner & Cook 336,771
Hay tedder, F. E. Kohler 336,726
Head screen, H. Garst 336,712
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Hoisting machine, B. P. Darling 336,630
Holder. See File holder. Pen holder. Towel holder. Type and space holder.
Hook. See Grab hook. Meat hook.
Hoop. See Wire hoop.
Horseshoe, W. S. McGowan, Jr 336,803
Indicator. See Pressure indicator. Scale indicator.
Insulator, C. L. Travis 336,828
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Jar. See Fruit jar.
Jar cover, W. F. McFarland 336,730
Key. See Telegraph key.
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Keyhole guard, W. W. Broga 336,780
Kiln for burning bricks, etc., W. Jones 336,720
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Lamp, automatic carbureting, J. Leede 336,572, 336,574
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Lamp, incandescent electric, J. M. A. Gerard-Lescuyer 336,637
Lamp, incandescent electric, W. Main 336,729
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Latch door, J. A. Hollenberger 336,810
Latch, gate, H. Harrington 336,714
Latch, sliding door, Gordon & Hamilton 336,638
Lathe for turning irregular forms, O. Kromer 336,815
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Looping-in switch, E. T. Gilliland 336,563
Lubricating steam engines, N. F. Burnham 336,838
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Machine table gauge, C. M. Lets 336,844
Mail, vehicle for delivering, H. B. Sortor 336,764
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Padlock, permutation, J. H. Julian 336,858
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Pen holder, C. Hollowede 336,644
Pen holder, M. J. Hughes 336,856
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Pianos and organs, music sheet and book supporter for, H. Worrall 336,613
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Planter, corn, L. E. Waterman 336,772
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Plow, Needles & Fisher 336,734
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Printing machine, G. F. Taylor 336,673
Projectile, R. B. Douglas 336,556
Propelling attachment for boats, F. Zschiegner 336,684
Propelling boats, device for, J. H. Bowers 336,787
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Pump, J. Humphreys, Jr 336,857
Pump, W. F. Mattes 336,654
Pump, centrifugal, E. J. Hawley 336,807
Pump, chain, J. N. Morrison 336,817
Pump, measuring, A. B. Simonds 336,761
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Railway, cable, R. Gilliham 336,561
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Reclining chair, G. K. Phillips 336,662
Reel. See Fishing reel.
Regulator. See Pressure regulator.
Rolling mill attachment, rod, A. J. Day 336,705
Ruler, F. A. Combes 336,700
Sad iron heater, J. Ringen 336,591
Saw, G. N. Clemson 336,697
Saw, J. J. Parker 336,739
Saw hanging, T. W. Peck 336,661
Sawmill head blocks, nose guard for, C. Esplin 336,631
Sawing machine, band, J. J. Bowen 336,693
Scale indicator, J. H. Rosecrans 336,595
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Screwdriver, J. S. Fray 336,560
Seal press, C. L. Pond 336,663
Seeder, disk, Galt & Tracy 336,711
Separator. See Cockle separator.
Sewer invert blocks, composition for making, S. A. Miller 336,732
Sewing machine, W. H. Waterman 336,607
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Sewing machine feed mechanism, G. W. Birchall 336,786
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Sewing on buttons, machine for, J. Mathison, 336,880, 336,881
Sewing or embroidering machines, feed motion for, E. Cornely 336,554
Shingle, metallic, A. N. Montrose 336,738
Shingling bracket, Leggett & Sanders 336,727
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Signaling apparatus, electric, E. T. Gilliland 336,562
Single-acting engine, twin cylinder, F. Plumb 336,743
Skate, roller, J. F. Mains 336,579
Skate, roller, W. R. Morris 336,816
Skate, velocipede, T. Tennent 336,600
Skates, safety wheel for roller, R. I. Towle 336,606
Slate cleaner, F. Wittram 336,612
Sled, bob, W. Fisher 336,632
Sleigh knee, A. Doll 336,555
Sliding gate, Thuston & Chase 336,601
Snow plow, C. D. Batchelor 336,833
Soldering machine, can, D. M. Monroe 336,659
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Spring clasp, J. J. Unbehend 336,769
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Stone sawing machines, feed mechanism for, F. H. Cook 336,840
Stopper. See Bottle stopper.
Stove hood or heat collector, J. G. W. F. Fleeming 336,559
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Telephone, mechanical, R. O. Middleton 336,781
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Tobacco package, Evans & Turner 336,801
Toboggan, J. R. McLaren, Jr 336,582
Tongue support, A. D. Tyler 336,605
Towel holder, C. H. Delanoy, Jr 336,704
Towing and securing hawsers or lines of vessels, apparatus for, H. Winter 336,829
Towing vessels, H. Winter 336,830
Traction wheel, Kelly & Dieter 336,649, 336,650
Trap. See Steam trap. Stench trap.
Tricycles, clutch for, D. H. Rice 336,588
Triturator, A. Babendreier 336,618
Truck, barrel, J. M. Bennett 336,620
Trunk strap, F. M. Masse 336,580
Tub. See Bathtub.
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Tubes, machine for forming serpentine, C. P. Higgins 336,854
Type and space holder, compositor's, Johnson & Low 336,719
Type case, compositor's, L. K. Johnson 336,646, 336,647
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Type writers, copy holder for, W. H. Clarkson 336,551
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Window spring and weather strip, combined, G. W. Lewin 336,575
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Wire, barbed, J. Potter 336,664
Wire hoop, J. C. Durling 336,706
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DESIGNS.

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NOTABLE and SIGNIFICANT ITEMS

FROM THE

FORTY-FIRST ANNUAL REPORT

OF THE

New York Life Insurance Company.

A total income of over sixteen million one hundred thousand dollars, and payments to policy-holders of nearly eight million dollars.

Interest income, over three million dollars, being about 5¾ per cent. on average net assets, and nearly four hundred thousand dollars in excess of losses by death.

Market value of securities, over three million three hundred thousand dollars in excess of their cost.

Liabilities, both actual and contingent, provided for, and a Divisible Surplus by the Company's standard of over seven million dollars; Surplus by the State standard, over thirteen million dollars.

An increase of nearly two million dollars in income, over three millions in surplus, over seven millions in assets, and of over thirty millions of insurance in force, during 1885.

SUMMARY of REPORT. BUSINESS of 1885.

Received in Premiums	$12,722,103.05
Received in Interest, Rents, etc.	3,399,069.71
Total Income	**$16,121,172.74**
Paid Death-claims	$2,999,109.64
" Endowments	741,764.47
" Annuities, Dividends, and for Policies purchased	3,940,999.64
Total Paid Policy-holders	**$7,681,873.75**
New Policies Issued	18,566
New Insurance Written	$68,521,452.00

CONDITION JAN. 1, 1886.

Cash Assets	**$106,864,321.32**
*Divisible Surplus, Co.'s Standard	$7,064,473.13
†Tontine " "	3,123,742.77
Total Surplus, " "	**$10,188,215.90**
Surplus by State Standard,	**$13,225,053.94**
Policies in Force	86,418
Insurance in force	$230,674,500.00

PROGRESS IN 1885.

Excess of Interest over Death-losses,	$399,960.07
Increase in Income	1,880,697.35
Increase in Surplus, State Standard,	3,513,707.48
Increase in Assets	7,580,567.75
Increase in Insurance Written	7,096,302.00
Increase in Insurance in Force	30,291,914.00

* Exclusive of the amount specially reserved as a contingent liability for Tontine Dividend Fund.
† Over and above a 4 per cent. reserve on existing policies of that class.

THE SEVEN ADVANTAGES

OF THE

New York Life Insurance Company's

NON-FORFEITING-TONTINE LIMITED ENDOWMENT POLICY.

FIRST ADVANTAGE.—Insurance for a definite amount, or for an amount increasing with each premium paid, as desired.

SECOND ADVANTAGE.—A Definite Cash Endowment, and a Tontine Dividend, to Policies in force at the end of Endowment and Tontine periods, which periods correspond, and may be either Ten, Fifteen, or Twenty Years.

THIRD ADVANTAGE.—Insurance for the full amount of the Policy, extended for as long a time as the value of the Policy will carry it, within the Endowment period, in case of discontinuance of payment of premiums after three years.

FOURTH ADVANTAGE.—A Grace of one month in the payment of premiums, during which time the policy holder's security is unimpaired.

FIFTH ADVANTAGE.—Three valuable options, including cash value, to policy-holders who survive their Tontine and Endowment periods and keep their policies in force.

SIXTH ADVANTAGE.—Practical freedom of action with respect to occupation, residence, and travel.

SEVENTH ADVANTAGE.—The payment of death claims immediately upon the approval of the required proofs of death.

Do not insure until you have seen full particulars of this Policy. Do not fail to write the nearest Agent or the Home Office for such particulars—at once. The NEW YORK LIFE INSURANCE COMPANY, 346 & 348 Broadway, New York City.

WILLIAM H. BEERS, President.
HENRY TUCK, Vice-President.
ARCHIBALD H. WELCH, 2d Vice-Pres't,
RUFUS W. WEEKS, Actuary.
THEODORE M. BANTA, Cashier.
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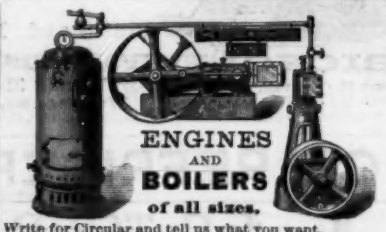

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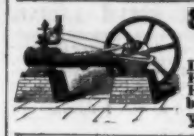

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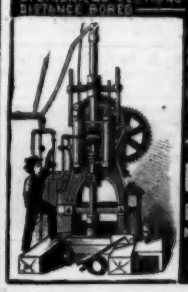

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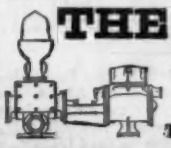

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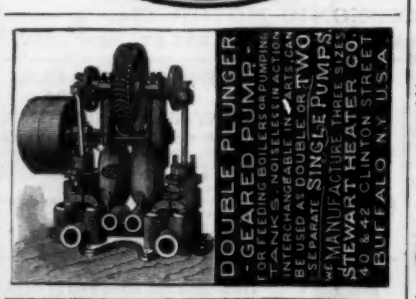

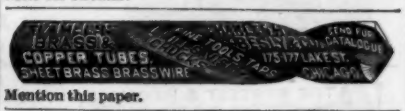

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